

5-25-06

PTO/SB/21 (09-04)

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/719,327
Filing Date	11/21/2003
First Named Inventor	Kenneth F. Fennewald et al.
Art Unit	3742
Examiner Name	Leonid M. Fastovsky
Total Number of Pages in This Submission	110
Attorney Docket Number	7377-000005

ENCLOSURES (check all that apply)

<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment / Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input checked="" type="checkbox"/> Petition and Exhibits A through G (109 pages) <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Return Receipt Postcard.
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm	Harness, Dickey & Pierce, P.L.C.		
Signature	<i>Kelly K. Burris</i>		
Printed Name	Kelly K. Burris		
Date	5/24/2006	Reg. No.	46,361

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name	Kelly K. Burris	Express Mail Label No.	EV 639016175 US
Signature	<i>Kelly K. Burris</i>	Date	5/24/2006

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PATENT

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CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service on May 24, 2005, with sufficient postage as first class mail (including Express Mail per MPEP § 512), and addressed to: Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Kelly K. Burris
Kelly K. Burris, Registration No. 46,361

Application No.: 10/719,327

Filing Date: 11/21/2003

Applicants: Kenneth F. Fennwald et al.

Group Art Unit: 3742

Examiner: Leonid M. Fastovsky

Title: TWO-WIRE LAYERED HEATER SYSTEM

Attorney Docket: 7377-000005

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

PETITION UNDER 37 C.F.R. § 1.181

In response to a Final Office Action received in the subject patent application, Applicants hereby petition for a decision that the status of "Final" is premature, in accordance with MPEP § 706.07(c). In light of the statements and remarks set forth below, Applicants respectfully request that the Office Action be changed to a Non-Final status. In support thereof, Applicants state as follows:

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1. On September 9, 2004, a first Office Action was issued on the merits.
(See Exhibit A).

2. On November 12, 2004, Applicants filed a response, presenting arguments without any claim amendments, to successfully overcome rejections presented by the first Office Action. (See Exhibit B).

3. On February 15, 2005, a second Office Action was issued on the merits, with new grounds of rejection and newly cited prior art. (See Exhibit C).

4. On July 7, 2005, Applicants filed a response to the second Office Action, including an interview summary from an on-site visit with the Examiner on June 14, 2005, wherein the two (2) remaining independent claims were amended to successfully overcome rejections presented by the Examiner during the on-site interview. (See Exhibit D).

5. On September 30, 2005, a third Office Action was issued on the merits, with new grounds of rejection based on another set of newly cited prior art. (See Exhibit E).

6. On December 30, 2005, Applicants filed a response to the third Office Action, without any claim amendments, to successfully overcome the rejections therein. (See Exhibit F).

7. On February 24, 2006, the subject Final Office Action was issued, with, again, new grounds of rejection based on yet another set of newly cited prior art. (See Exhibit G).

8. The February 24, 2006 final Office Action states "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action."

However, the claims were not amended in the December 30, 2005 response and thus there was no amendment that necessitated the new grounds of rejection.

Under 37 C.F.R. § 1.113, a rejection may be made final: " ... whereupon applicant's, or for ex parte reexaminations filed under § 1.510, patent owner's reply is limited to appeal in the case of rejection of any claim (§ 41.31 of this title), or to amendment as specified in § 1.114 or § 1.116."

The December 30, 2005 reply was not limited to appeal and was not an amendment under § 1.114 or § 1.116. Instead, the December 30, 2005 reply presented arguments that in fact overcame the outstanding claim rejections. Therefore, Applicants submit that the Outstanding Office Action cannot be made final. Furthermore, the claim amendments filed on July 7, 2005 cannot be presented as necessitating the new grounds of rejection since these claim amendments overcame the rejections in the previous Office Action/on-site interview. If the amendments filed on July 7, 2005 necessitated new grounds, then the September 30, 2005 Office Action would have been final. As set forth above, the September 30, 2005 Office Action was non-final.

The subject Final Office Action contains the third set of new grounds of rejection and newly cited prior art. Having overcome all previous claim rejections, Applicants have not previously had an opportunity to argue these new grounds and therefore submit that the Outstanding "Final" Office Action is premature. As MPEP §706.07 states "...present practice does not sanction hasty and ill-considered final rejections. The applicant who is seeking to define his or her invention in claims that will give him or her the patent protection to which he or she is justly entitled should receive the

cooperation of the examiner to that end, and not be prematurely cut off in the prosecution of his or her application.”

In view of the above, Applicants respectfully request that the status of the outstanding Office Action be changed from Final to Non-Final.

Applicant believes there are no fees due in connection with the filing of this Petition. However, should there be fees due, the Commissioner is authorized to charge any necessary fees to our Deposit Account No. 08-0750.

Respectfully submitted,

Dated: 24 MAY 06

By: Kelly K. Burris
Kelly K. Burris
Reg. No. 46,361

HARNESS, DICKEY & PIERCE, P.L.C.
7700 Bonhomme Rd.
Suite 400
St. Louis, MO 63105
(314) 726-7500



7377-000005/45
MAY 24 2006
UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,327	11/21/2003	Kenneth F. Fennewald	7377-000005/US	2615

28997 7590 09/03/2004

HARNESS, DICKEY, & PIERCE, P.L.C.
7700 BONHOMME, STE 400
ST. LOUIS, MO 63105

EXAMINER

FASTOVSKY, LEONID M

ART UNIT

PAPER NUMBER

3742

DATE MAILED: 09/03/2004

RECEIVED
SEP 09 2004

HARNESS, DICKEY & PIERCE
ST. LOUIS, MISSOURI

Please find below and/or attached an Office communication concerning this application or proceeding.

EXHIBIT

tabbies

A

7377-000005/US

3 month OIA due 12/3/04

Office Action Summary

Application No. **10/719,327**
 Examiner **Leonid M Pavlovsky**
 MAY 24 2006
 RECEIVED OFFICE

Applicant(s)
FENNEWALD ET AL.
 Art Unit
3742

-- The MAILING DATE of this communication appears on the cover sheet in the correspondence address --
 Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
 2a) ☐ This action is **FINAL**. 2b) ☒ This action is **non-final**.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 19-23 is/are pending in the application.
 4a) Of the above claim(s) 4 is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 1-3, 5-14 and 19-23 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☒ The drawing(s) filed on 21 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date 20031121.
 4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
 5) ☐ Notice of Informal Patent Application (PTO-152)
 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of species (Fig. 13 and 5-7) in the reply filed on 8/2/04 is acknowledged.
2. Claim 4 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species of Fig. 4, there being no allowable generic or linking claim.

Claim Rejections- 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 6, 11, 14 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juliano et al (5,973,296) in view of Godwin et al 96,305,923).
Juliano teaches substantially the claimed invention having a heater system (Fig. 6) comprising a thick film resistive element 86 defining a substrate 74, a dielectric layer 84, a temperature sensor 88 and protective layer 48. However, he does not teach a controller and microprocessor. Godwin teaches a system with film heaters 63, 65 and 67 comprising controller and microprocessor (col. 7, lines 17-30). It would have been obvious to one having ordinary skill in the art to modify Juliano's invention to include a controller and microprocessor in order to carry control and logic signals as taught by Godwin (col. 7, lines 29-35).

As for claim 3, Godwin teaches thin film heaters 63, 65 and 67.

As for claim 19-23, it would be obvious to operate a layered heater in the device of Juliano as taught by Godwin because he teaches a structure that inherently capable of use as set forth in claims 19-23 in accordance with MPEP 2131.01.

5. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juliano in view of Godwin and further in view of Miyata et al (6,448,538).

Juliano in view of Godwin teaches substantially the claimed invention, but does not teach a sol-gel heater and thermal spray. Miyata teaches a sol-gel heater (col. 10, lines 10-20) and thermal spray (col. 20, lines 36-44). It would have been obvious to one having ordinary skill in the art to modify the invention of Juliano in view of Godwin to include a sol-gel heater in order to protect the exposed edge from the outside covering with a ceramic film as taught by Miyata (col. 10, lines 12-17), and also to make a thermally sprayed heater as conventional in the art as taught by Miyata (col. 20, lines 36-44).

6. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juliano in view of Godwin and further in view of Haas (6,770,848).

Juliano in view of Godwin teaches substantially the claimed invention, but does not teach a controller with DC and AC control. Haas teaches a film heater 50 comprising a controller 30 capable of operating with DC or AC control. It would have been obvious to one having ordinary skill in the art to modify the invention of Juliano in view of Godwin to use a controller with AC or DC control as conventional in the art as taught by Haas.

7. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juliano in view of Godwin and further in view of Lumsden (6,489,742).

Juliano in view of Godwin teaches substantially the claimed invention, but does not teach a controller having an angle firing and a shunt resistor. Lumsden teaches a controller 8 comprises an angle firing (col. 7, lines 1-10) and shunt resistor (claim 1). It would have been obvious to one having ordinary skill in the art to modify the invention of Juliano in view of Godwin to include a controller comprising an angle firing and a shunt resistor to compute for controlling current as taught by Lumsden (col. 6, lines 55-67).

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juliano in view of Godwin and further in view of Waggoner et al (6,752,491). Juliano in view of Godwin teaches substantially the claimed invention, but does not teach a controller with firmware. Waggoner teaches a heater resistor having a controller 80 comprising firmware. It would have been obvious to one having ordinary skill in the art to modify the invention of Juliano in view of Godwin to include a controller comprising firmware in order to control various functions as taught by Waggoner (col. 2, lines 63-67).

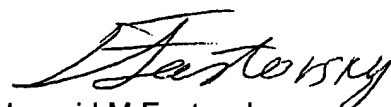
Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. 5665262 (layer heater), 5504307 (heat material), 6222166 (thick film heater), 6762396 (resistive coatings).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid M Fastovsky whose telephone number is 703-306-5482. The examiner can normally be reached on M-Th. 8.00 am -6.00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 703-305-5766. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Leonid M Fastovsky
Examiner
Art Unit 3742

lmf



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Substitute for form 1449A/PTO

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Sheet	01
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Attorney Docket Number

Complete if Known

Application Number

10/719.327

Filing Date

November 21, 2003

First Named Inventor

Kenneth F. Fennewald et al.

Art Unit

Unknown

Examiner Name

Unknown

Attorney Docket Number

7377-000005/US

U.S. PATENT DOCUMENTS

Examiner Initials *	Cite No.¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code² (# known)			
LMP		4,549,073	10-22-1985	Tamura et al.	
		4,623,969	11-18-1986	Bensoussan et al.	
		4,638,147	01-20-1987	Dytch et al.	
		4,688,547	08-25-1987	Ballard et al.	
		4,713,525	12-15-1987	Eastep	
		4,736,091	04-05-1988	Moe	
		4,829,447	05-09-1989	Parker et al.	
		4,843,084	06-27-1989	Parker et al.	
		5,036,181	07-30-1991	Fishman	
		5,072,098	12-10-1991	Matthews et al.	
		5,105,067	04-14-1992	Brekkestran et al.	
		5,280,422	01-18-1994	Moe et al.	
		5,521,850	05-28-1996	Moe et al.	
		5,973,296	10-26-1999	Juliano et al.	
		6,305,923	10-23-2001	Godwin et al.	
LMP		6,341,954	01-29-2002	Godwin et al.	
		6,575,729	06-10-2003	Godwin et al.	

FOREIGN PATENT DOCUMENTS

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**Examiner
Signature**

Fastovsky

Date Considered

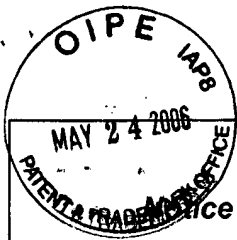
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¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04.

³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

EL 961489803 US



Office of References Cited	Application/Control No. 10/719,327	Applicant(s)/Patent Under Reexamination FENNEWALD ET AL.	
	Examiner Leonid M Fastovsky	Art Unit 3742	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,762,396	07-2004	Abbott et al.	219/543
	B	US-5,665,262	09-1997	Hajaligol et al.	219/553
	C	US-6,222,166	04-2001	Lin et al.	219/538
	D	US-6,752,491	06-2004	Waggoner et al.	347/85
	E	US-6,770,848	08-2004	Haas et al.	219/212
	F	US-6,448,538	09-2002	Miyata, Seiichiro	219/444.1
	G	US-6,489,742	12-2002	Lumsden, John	318/727
	H	US-5,504,307	04-1996	Hayashi et al.	219/543
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	K	US-			
	L	US-			
	M	US-			

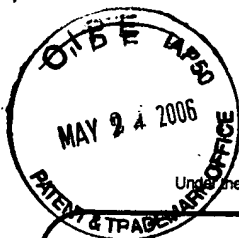
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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		Examiner Name	Leonid M. Fastovsky
Total Number of Pages in This Submission		Attorney Docket Number	7377-000005

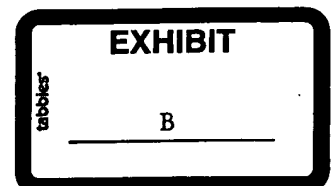
ENCLOSURES (check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment / Reply (7 pages) <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Response to Missing Parts/ Incomplete Application <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53	<input checked="" type="checkbox"/> Drawing(s) (12 replacement sheets) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____	<input type="checkbox"/> After Allowance Communication to Technology Center (TC) <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Return Receipt Postcard
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	Kelly K. Burris, Reg. No. 46,361 Harness, Dickey & Pierce, P.L.C.
Signature	<i>Kelly K. Burris</i>
Date	November 12, 2004

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Typed or printed name	Kelly K. Burris	Express Mail Label No.	EL 961489560 US
Signature	<i>Kelly K. Burris</i>	Date	November 12, 2004

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Kelly K. Burris
Kelly K. Burris, Registration No. 46,361

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Group: 2615
Examiner: Leonid M. Fastovsky
TWO-WIRE LAYERED HEATER SYSTEM
Att. No.: 7377-000005

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Sir:

In response to the Office Communication dated September 3, 2004, please amend the above-identified application as follows and consider the remarks set forth below.

Amendments to the Drawings begin on page 2 of this paper.

Remarks begin on page 3 of this paper.

AMENDMENTS TO THE DRAWINGS

The attached "Replacement Sheets" of drawings include changes to Figures 1-13. The attached "Replacement Sheets," which include Figures 1-13, replace the original sheets including Figures 1-13.

Attachment: Replacement Sheets

REMARKS

Claims 1-14 and 19-23 are now pending in the application. Claims 1-3, 5-14, and 19-23 have been rejected. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

DRAWINGS

Applicant has attached revised drawings for the Examiner's approval. In the "Replacement Sheets," Applicant has replaced hand-drawn elements and leader lines with computer generated leader lines to make formal, non-substantive changes to the drawings. Applicant respectfully requests that the "Replacement Sheets" be approved and entered in the present application.

ELECTIONS/RESTRICTIONS

The Outstanding Office Action states that Applicant elected Fig. 13 and 5-7. However, Applicant elected the species in Figs. 1, 2, 3, and 5-7. It appears as though "Fig. 13" in the Outstanding Office Action is a typographical error and instead should be "Figs. 1-3." Regardless, Applicant respectfully requests further clarification from the Examiner on the elected species if this is not in fact a typographical error.

Additionally, the Outstanding Office Action states that Claim 4 is withdrawn as being drawn to a nonelected species of Fig. 4. However, Claim 4 is not drawn to the nonelected species of Fig. 4. Fig. 4 (Figs. 4A-4C) contains various resistive layer patterns such as rectangular (Fig. 4A), circular (Fig. 4B), and spiral (Fig. 4C), and Claim 4 is directed to a thermally sprayed heater without language or limitations

directed to any of these resistive layer patterns. Claim 4 is instead drawn to the elected species of Figs. 1, 2, 3, and 5-7. Therefore, Claim 4 should not be withdrawn and Applicant respectfully requests that Claim 4 be examined with the remaining claims in the present application.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-3, 6, 11, 14, and 19-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Juliano et al. (U.S. Pat. No. 5,973,296) in view of Godwin et al. (U.S. Pat. No. 6,305,923). This rejection is respectfully traversed.

Claims 1-3, 6, 11, 14, and 19-23 include a resistive layer that is **both** a heater element **and** a temperature sensor. Neither Juliano et al. nor Godwin et al. include a resistive layer that is **both** a heater element and a temperature sensor. As noted by the Outstanding Office Action, Juliano et al. requires a **separate** layer as a temperature sensor, and Godwin et al. similarly requires a **separate** temperature sensor. Since neither Juliano et al. nor Godwin et al. disclose or teach a resistive layer that is both a heater element and a temperature sensor, these claims cannot be obvious.

As stated in the specification, (paragraphs [0032] and [0034]), the advantages of using the resistive layer as both a heater element and a temperature sensor include using only a single set of electrical leads rather than one set for the heater and one set for the temperature sensor, thus drastically reducing the bulk and complexity of a heating system. Furthermore, since the entire resistive layer is a temperature sensor, temperature is sensed throughout the entire heater element rather than at a single point as with many conventional temperature sensors such as

a thermocouple. There is clearly no teaching of such a system in Juliano et al. or Godwin et al., and thus the Applicant respectfully requests that these claim rejections be withdrawn.

Claims 4-5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Juliano et al. in view of Godwin et al. and further in view of Miyata et al. (U.S. Pat. No. 6,448,538). This rejection is respectfully traversed.

Similar to the claims discussed above, Claims 4-5 include a resistive layer that is **both** a heater element **and** a temperature sensor. None of the cited references disclose or teach a resistive layer that is both a heater element and a temperature sensor, and thus Claims 4-5 distinguish over these references for at least the reasons as stated above. Accordingly, Applicant respectfully requests that these claim rejections be withdrawn.

Claims 7-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Juliano et al. in view of Godwin et al. and further in view of Haas (U.S. Pat. No. 6,770,848). This rejection is respectfully traversed.

Claims 7 and 8 depend from Claim 6 and distinguish over these references for at least the reasons stated above in connection with Claim 6. Namely, none of the cited references disclose a resistive layer that is **both** a heater element **and** a temperature sensor. Accordingly, Applicant respectfully requests that these claim rejections be withdrawn.

Claims 9-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Juliano et al. in view of Godwin et al. and further in view of Lumsden (U.S. Pat. No. 6,489,742). This rejection is respectfully traversed.

Claims 9 and 10 depend from Claim 6 and distinguish over these references for at least the reasons stated above in connection with Claim 6. Namely, none of the cited references disclose a resistive layer that is **both** a heater element **and** a temperature sensor. Accordingly, Applicant respectfully requests that these claim rejections be withdrawn.

Claim 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Juliano et al. in view of Godwin et al. and further in view of Waggoner (U.S. Pat. No. 6,752,491). This rejection is respectfully traversed.

Claim 13 depends from Claim 6 and distinguishes over these references for at least the reasons stated above in connection with Claim 6. Namely, none of the cited references disclose a resistive layer that is **both** a heater element **and** a temperature sensor. Accordingly, Applicant respectfully requests that these claim rejections be withdrawn.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the Outstanding Office Action, and as such, the present application is in condition for further prosecution. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (314) 726-7524.

Respectfully Submitted,

Dated: 12 Nov 04

By: Kelly K. Burris

Kelly K. Burris, Reg. No. 46,361

HARNESS, DICKEY & PIERCE, P.L.C.
7700 Bonhomme Ave., Suite 400
St. Louis, MO 63105
(314)726-7500

[KKB/lds]



1/12

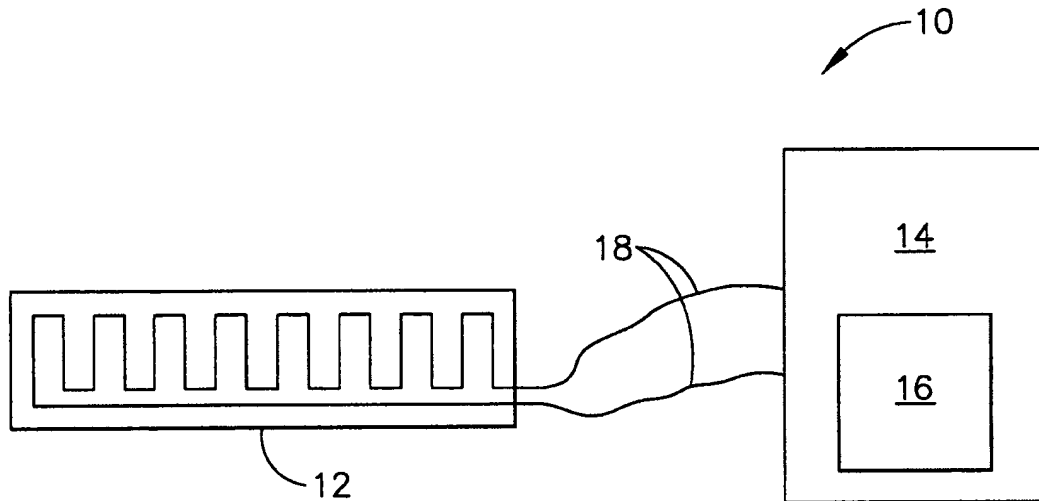


FIG. 1

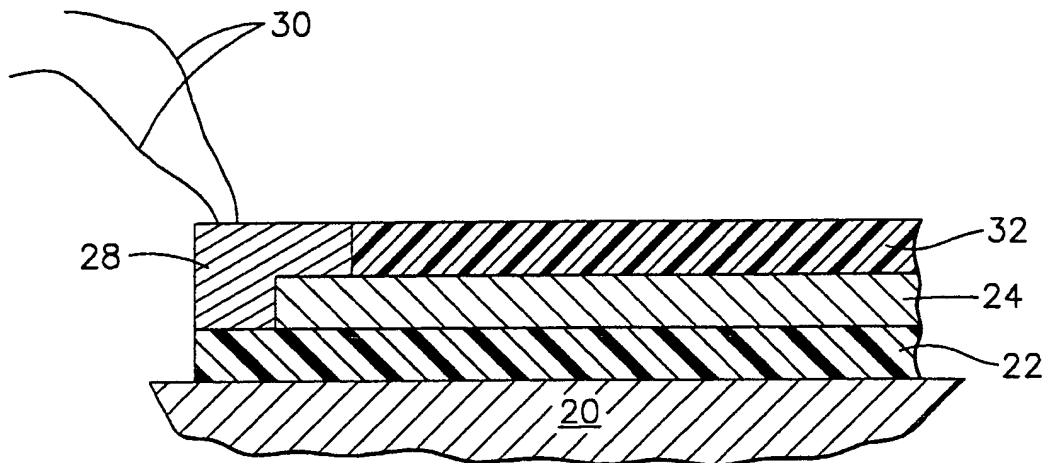


FIG. 2

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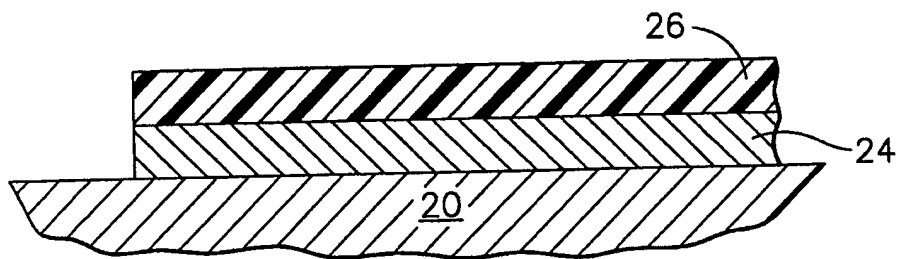


FIG. 3A

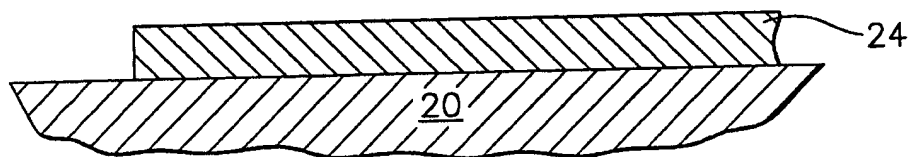


FIG. 3B

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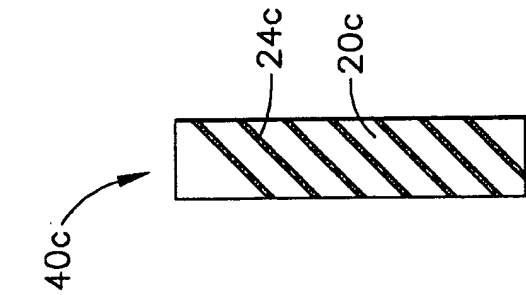


FIG. 4C

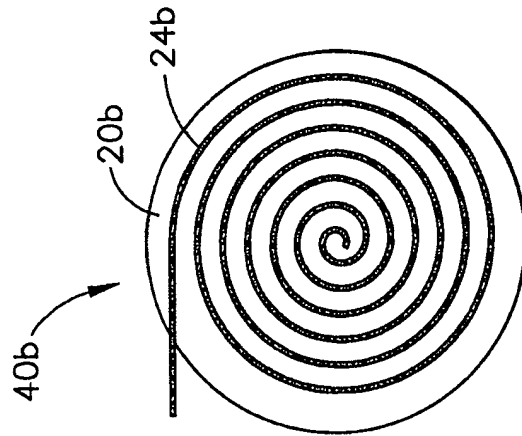


FIG. 4B

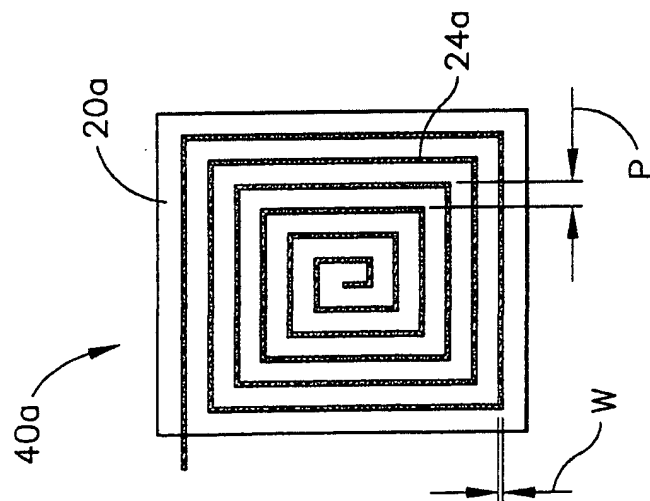


FIG. 4A

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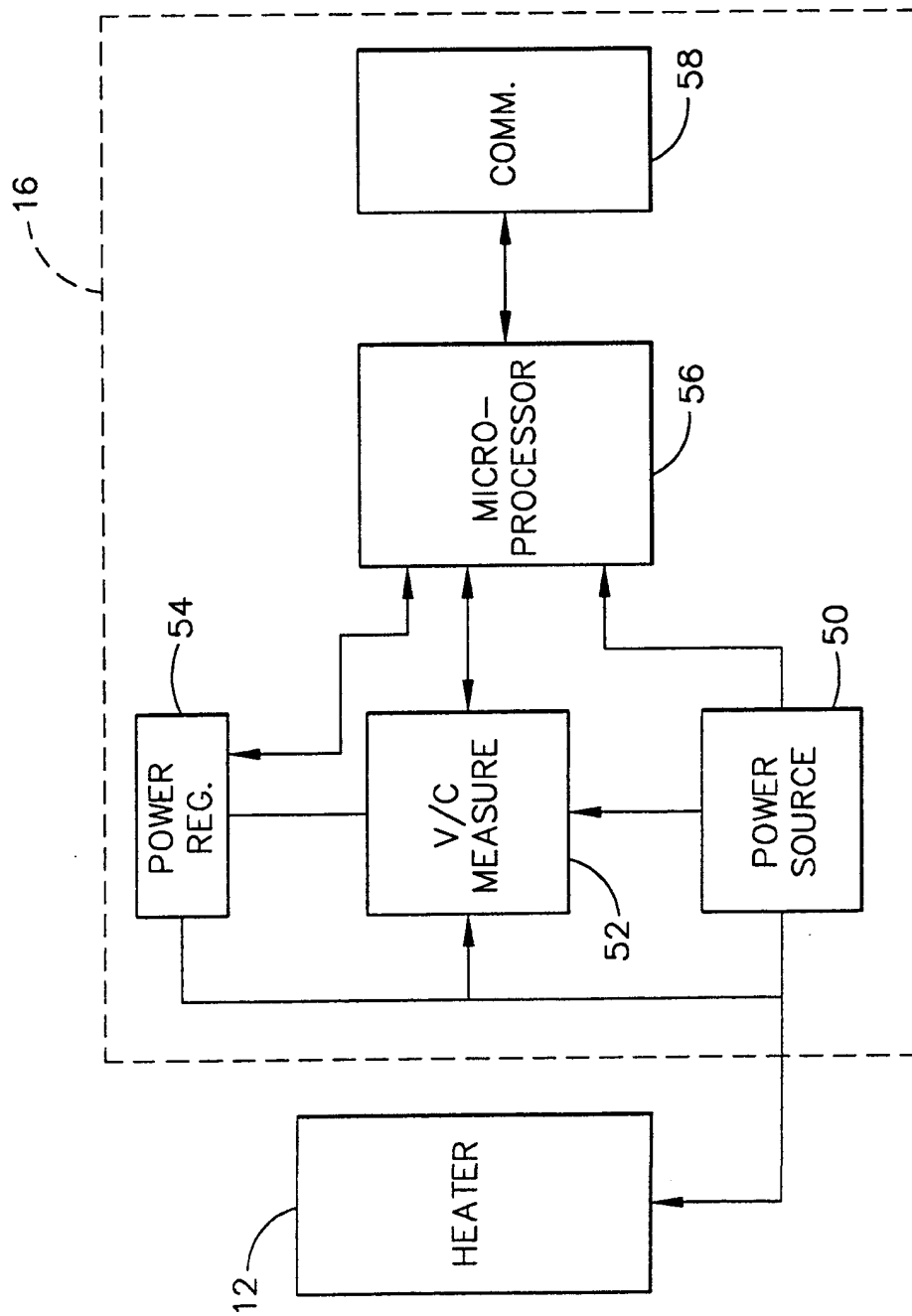


FIG. 5

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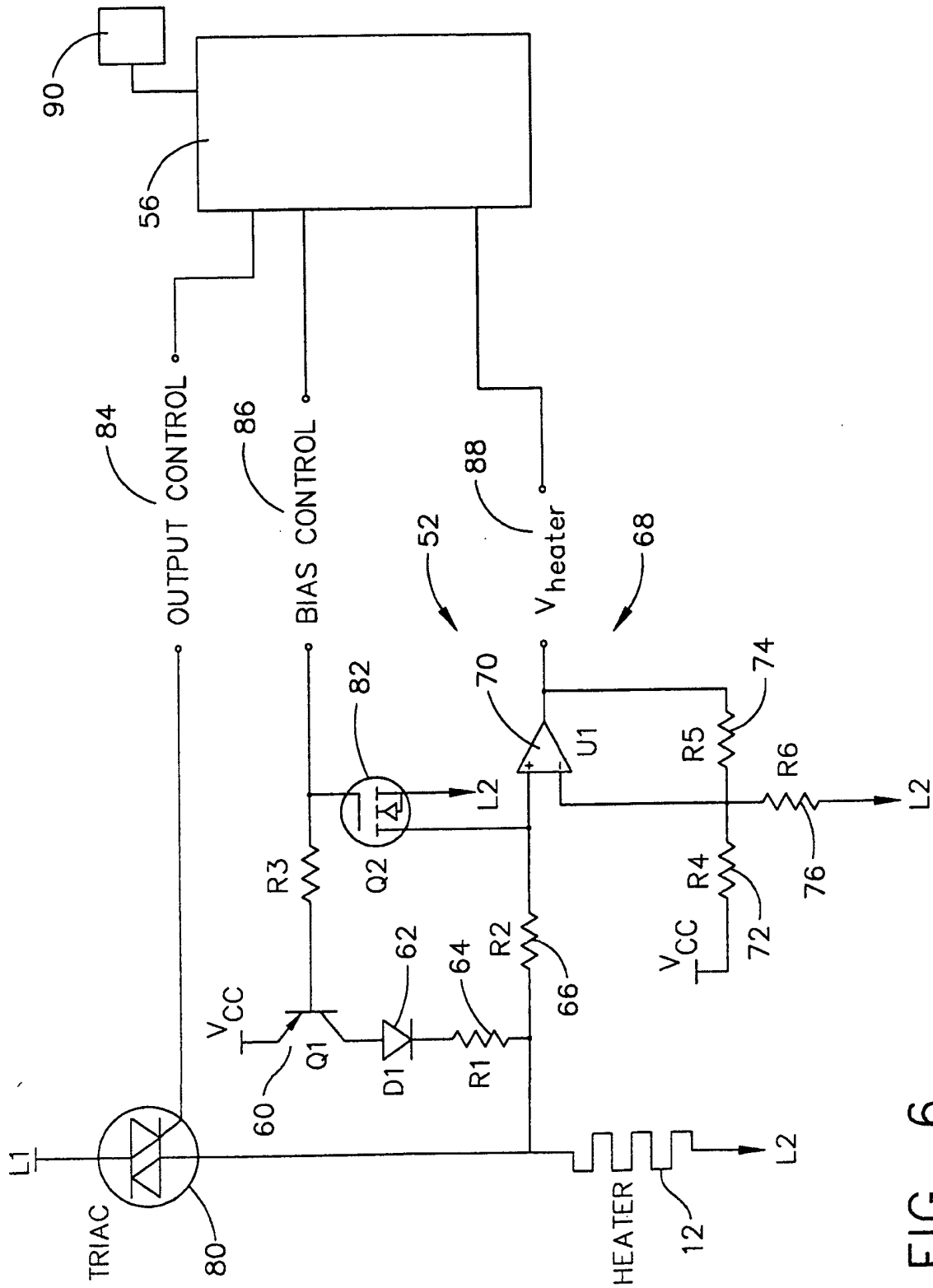
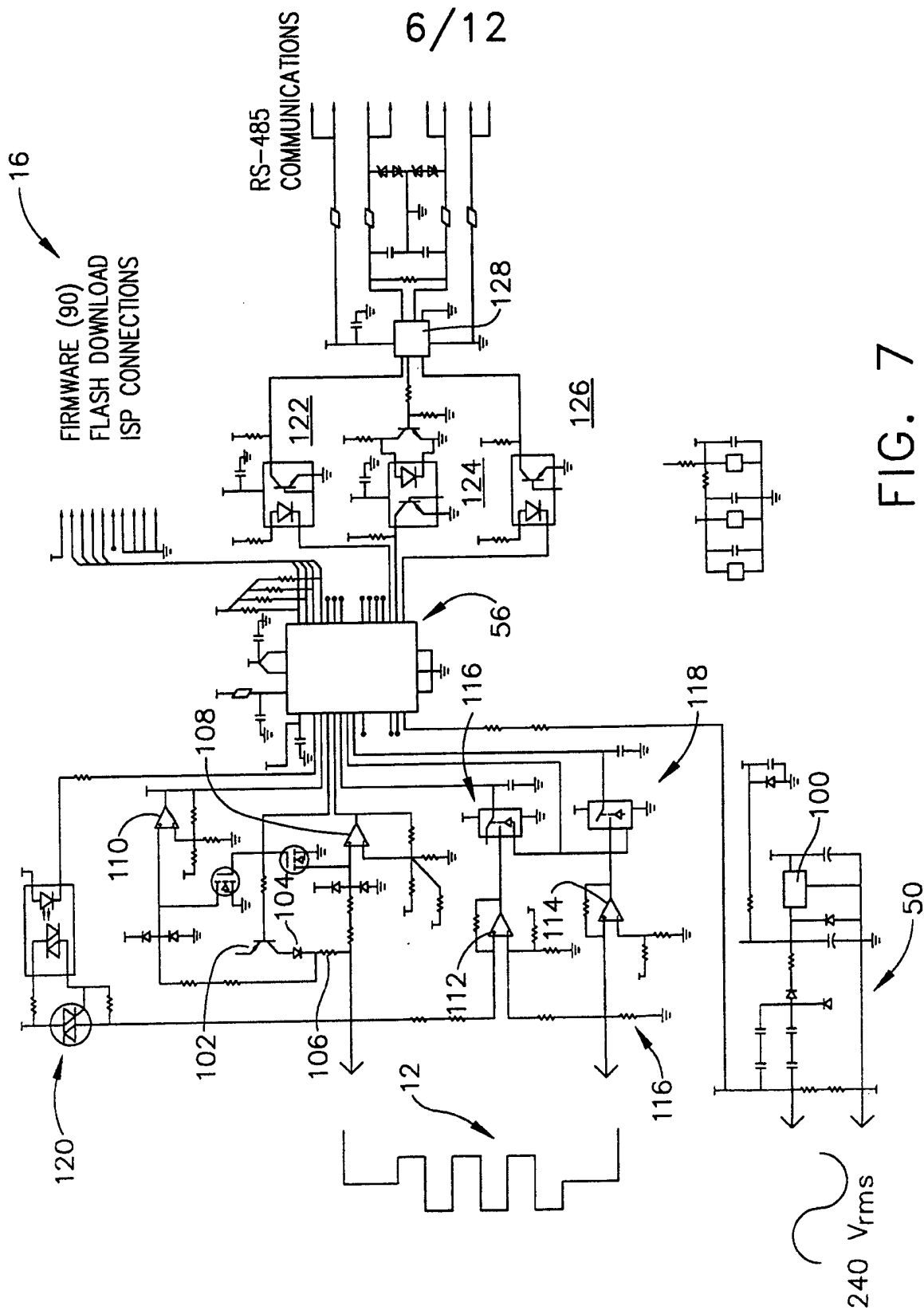


FIG. 6



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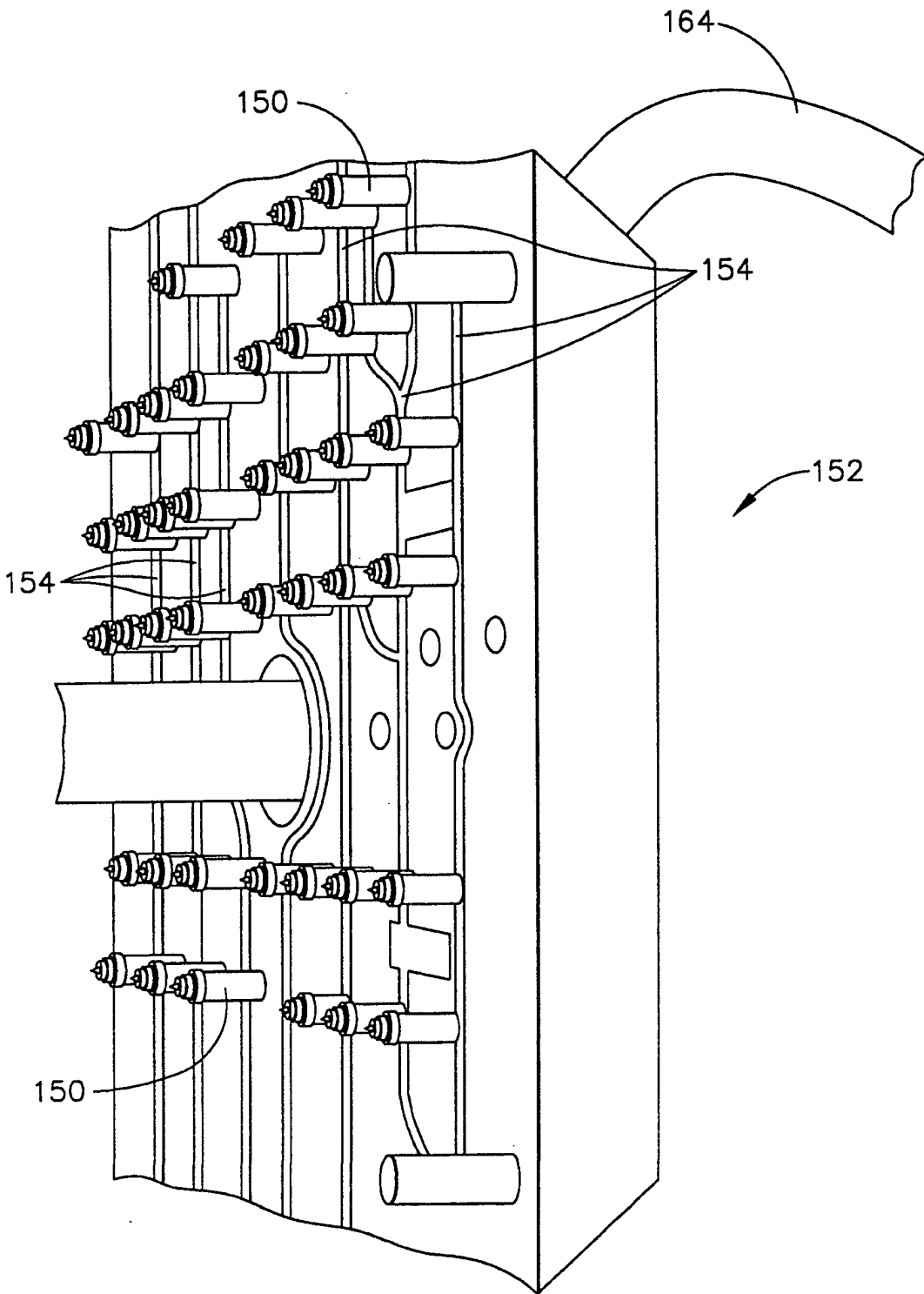


FIG. 8

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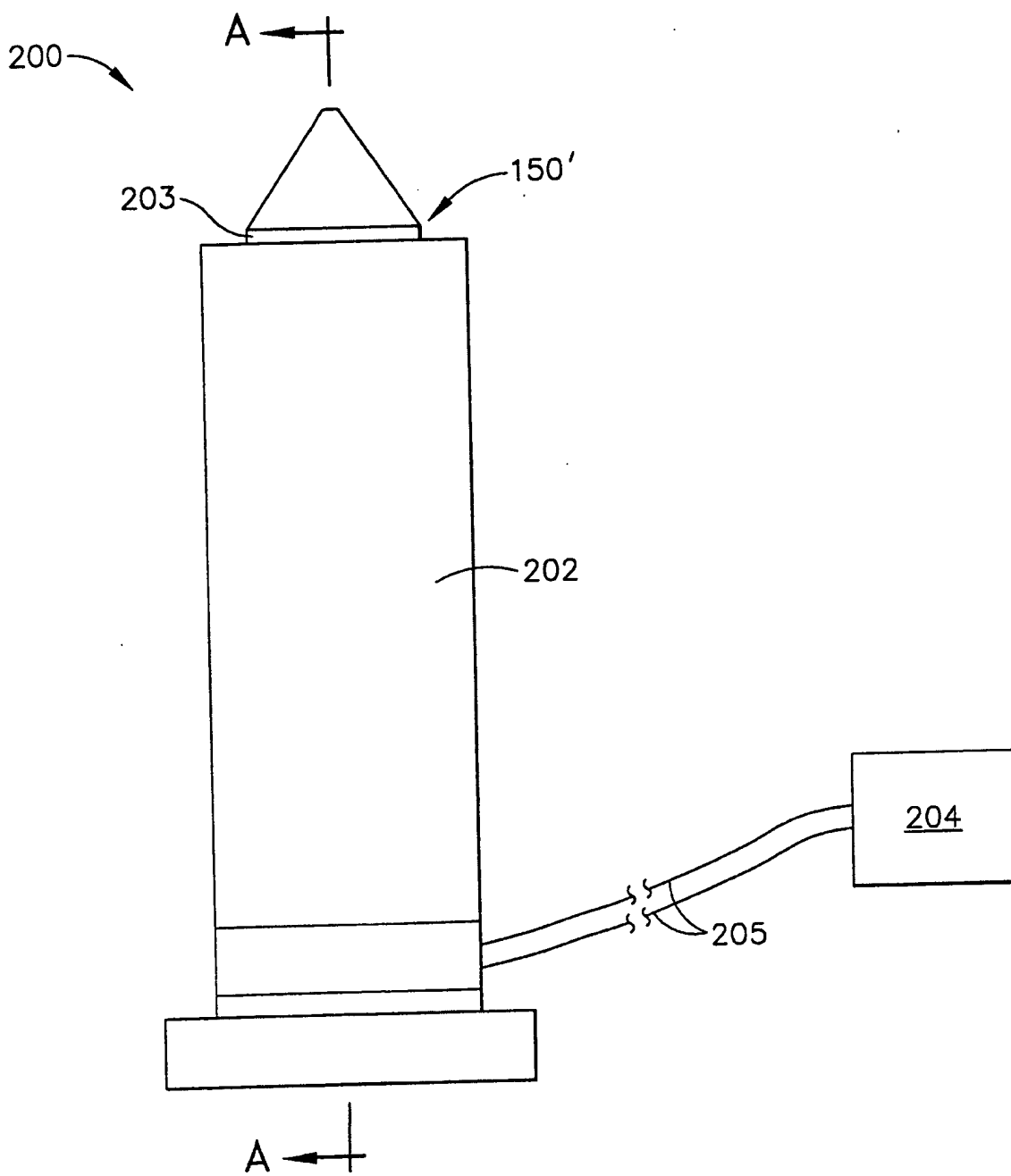


FIG. 9

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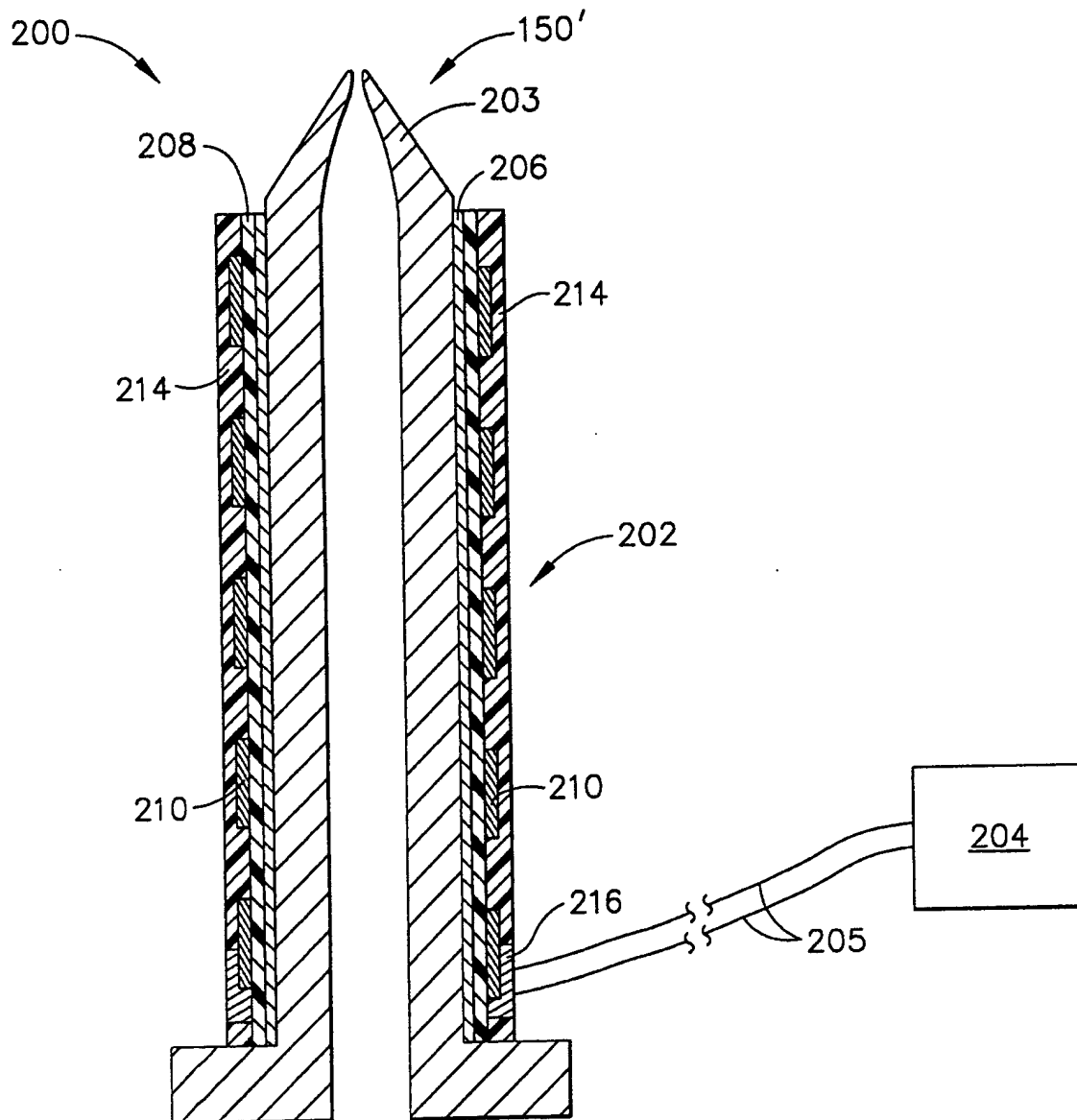


FIG. 10

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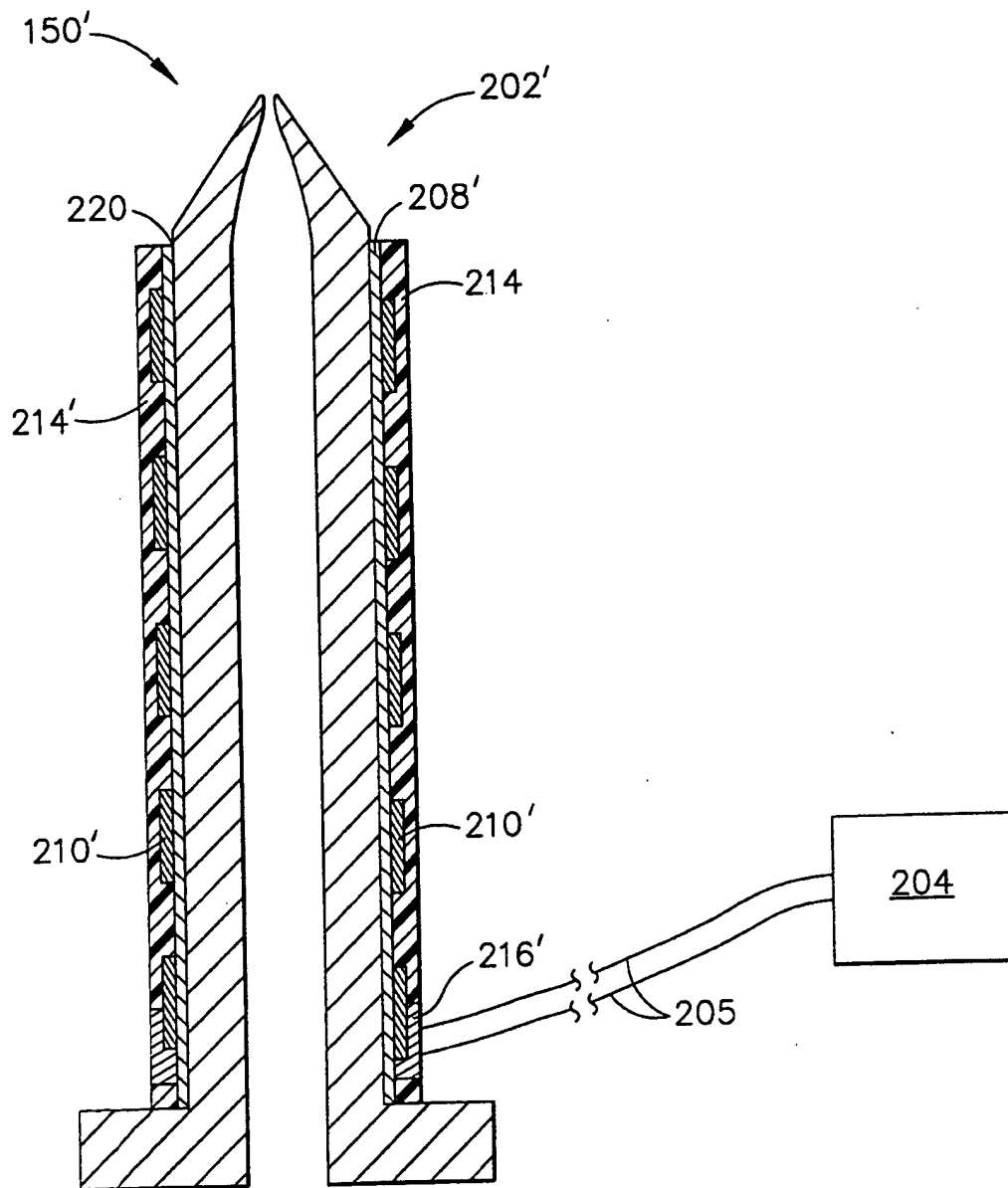


FIG. 11

11/12

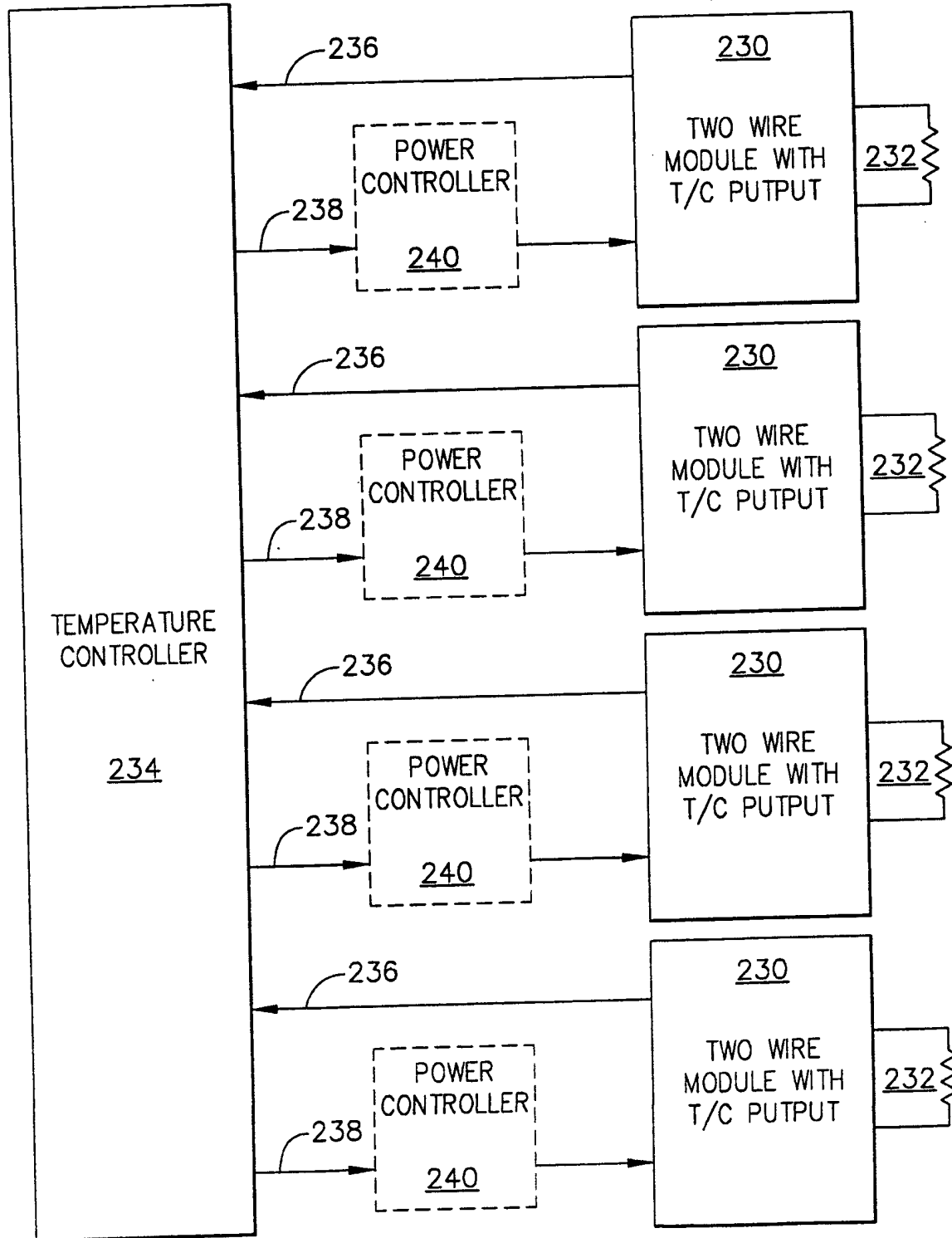


FIG. 12

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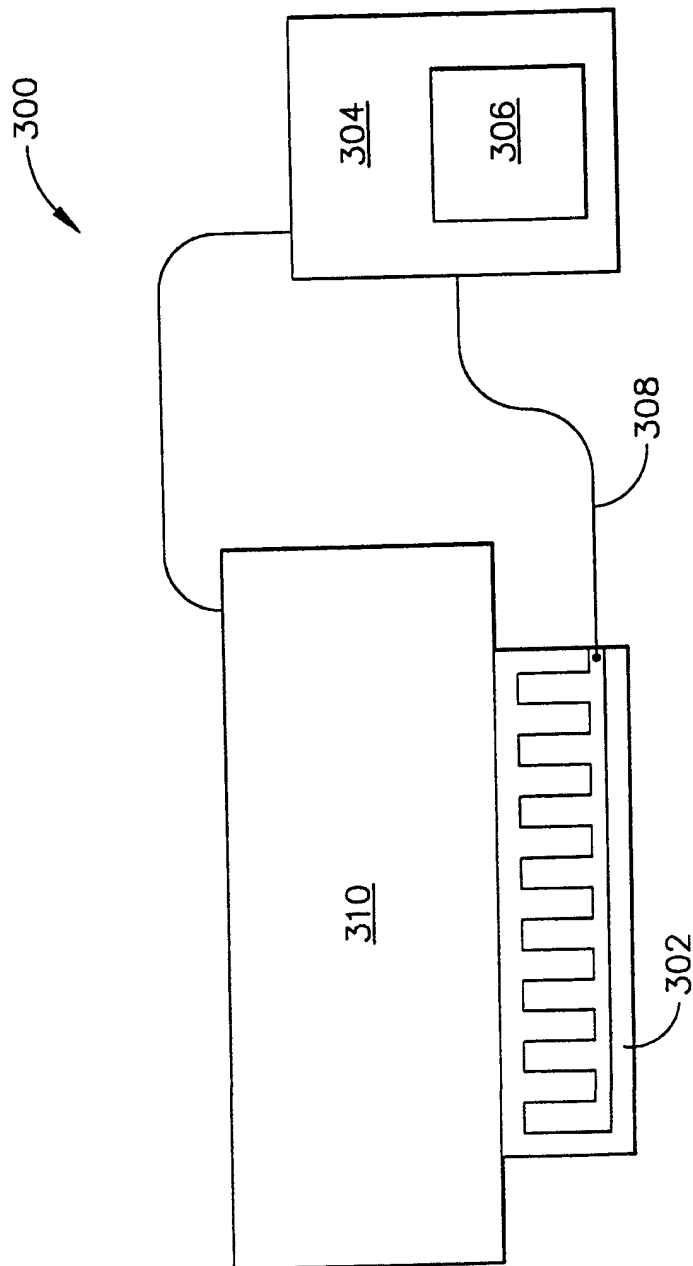
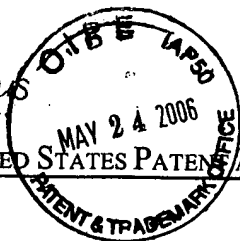


FIG. 13

Applicant:	Kenneth F. Fennewald et al.	Client Matter #	7377-000005/US
Serial/Patent #	10/719,327	Filing/Issue Date	November 21, 2003
Title:	Two-Wire Layered Heater System		
Please acknowledge receipt of:			
Transmittal (1 page); Amendment (7 pages); and Drawings (12 replacement sheets).			
Express Mail #	EL 961489560 US		USPTO Date Stamp
By stamping at:	Turning to Harness, Dickey & Pierce, P.L.C.		
Mailed:	November 12, 2004	Attorney:	Kelly K. Burris/lbs

7377-000005/US



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/719,327

11/21/2003

Kenneth F. Fennewald

7377-000005/US

2615

28997

7590

02/15/2005

HARNESS, DICKEY, & PIERCE, P.L.C.
7700 BONHOMME, STE 400
ST. LOUIS, MO 63105

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FEB 22 2005

HARNESS, DICKEY & PIERCE
ST. LOUIS, MISSOURI

EXAMINER

FASTOVSKY, LEONID M

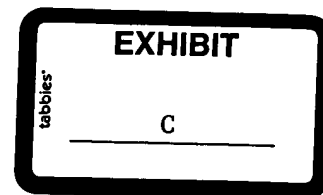
ART UNIT

PAPER NUMBER

3742

DATE MAILED: 02/15/2005

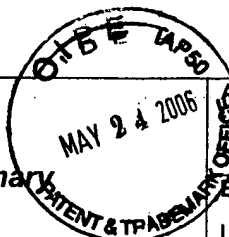
Please find below and/or attached an Office communication concerning this application or proceeding.



7377-000005/US

3 Mo 2nd OA due
5/15/05

Office Action Summary



Application No.

D/719,327

Applicant(s)

FENNEWALD ET AL.

Examiner

Leonid M Fastovsky

Art Unit

3742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 12, 15-18 and 24 is/are withdrawn from consideration.
- 5) ☒ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 13, 14 and 19-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Receipt of Applicant's amendment filed on 11/13/04 is acknowledged.

Upon further consideration the Restriction/Election of claim 4 has been withdrawn and it is treated on its merits in this Office Action.

However, claim 12 is still withdrawn because it belongs to the non-elected species of Fig. 4.

Specification

2. The abstract of the disclosure is objected to because it contains an extraneous word "comprises". Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 3-4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayashi et al (5,504,307).

Hayashi teaches a thin film heater comprising at least one resistive layer 5a, the resistive layer made out of NiCr (col. 5, lines 25-44), thus inherently having sufficient

temperature coefficient of resistance characteristics such that the resistive layer is a heater element and a temperature sensor, and a two-wire controller 61 connected to the resistive layer of the heater 51 (Fig. 17), wherein the controller determines temperature of the thin film heater using the resistance of the resistance layer 5a and controls the heater temperature accordingly.

As for claim 4, Hayashi teaches a thermally sprayed heater (col. 1, lines 59-63).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-2, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Little (6,043,467).

Hayashi discloses substantially the claimed invention comprising a heater system (Fig. 4) comprising a film heater defining a substrate 2, a dielectric layer 4, a resistive layer 5a, a protective layer 6, and a two-wire controller 61, but does not disclose a thick film heater. Little discloses a thick film heater having conductive track 3 made out of nickel (col. 3, lines 1-10) and a controller (col. 6, lines 1-10). It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a thick film as taught by Little in order to carry control of the temperature in Hayasi's heater system.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Miyata et al (6,448,538).

Hayashi teaches substantially the claimed invention, but does not teach a sol-gel heater and thermal spray. Miyata teaches a sol-gel heater (col. 10, lines 10-20) and thermal spray (col. 20, lines 36-44). it would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a sol-gel heater in order to protect the exposed edge from the outside covering with a ceramic film as taught by Miyata (col. 10, lines 12-17).

8. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Haas (6,770,848).

Hayashi teaches substantially the claimed invention, but does not teach a controller with DC and AC control. Haas teaches a film heater 50 comprising a controller 30 capable of operating with DC or AC control. It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to use a controller with AC or DC control as taught by Haas in order to control calculation of the resistance of the resistive layer of Hayashi.

9. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Lumsden (6,489,742).

Hayashi teaches substantially the claimed invention, but does not teach a controller having an angle firing and a shunt resistor. Lumsden teaches a controller 8 comprises an angle firing (col. 7, lines 1-10) and shunt resistor (claim 1). It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a controller comprising an angle firing and a shunt resistor for controlling current as taught by Lumsden (col. 6, lines 55-67).

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Waggoner et al (6,752,491).

Hayashi teaches substantially the claimed invention, but does not teach a controller with firmware. Waggoner teaches a heater resistor having a controller 80 comprising firmware. It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a controller comprising firmware in order to control various functions as taught by Waggoner (col. 2, lines 63-67).

11. Claims 11 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Godwin.

Hayashi discloses substantially the claimed invention including a controller, but does not disclose a microprocessor and a method of operating a layered heater. Godwin discloses a heater system comprising film heaters 63,65 and 67, a controller and a microprocessor (col. 7, lines 15-30). It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a microprocessor as taught by Godwin in order to carry logic operation means (col. 7, lines 16-23) that are also applied to a method of operating a layer heater of Hayashi.

Response to Arguments

12. Applicant's arguments with respect to claims 1-11, 13-14 and 19-23 have been considered but are moot in view of the new ground(s) of rejection.


Application/Control Number: 10/719,327
Art Unit: 3742

Page 6

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid M Fastovsky whose telephone number is 571-272-4778. The examiner can normally be reached on M-Th. 8.00 am -6.00 pm.

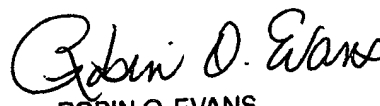
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

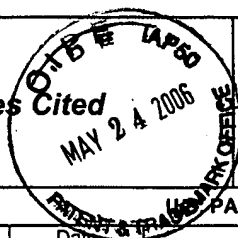

Leonid M Fastovsky
Examiner
Art Unit 3742

2/8/05

lmf


ROBIN O. EVANS
PRIMARY EXAMINER
2/11/05

Notice of References Cited



Application/Control No.

10/719,327

Applicant(s)/Patent Under
Reexamination
FENNEWALD ET AL.

Examiner

Leonid M Fastovsky

Art Unit

3742

Page 1 of 1

PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,043,467	03-2000	Little, Peter James	219/542
	B	US-5,504,307	04-1996	Hayashi et al.	219/543
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

**TRANSMITTAL
FORM**

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

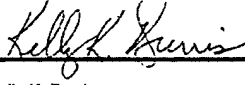
Application Number	10/719,327
Filing Date	11/21/2003
First Named Inventor	Kenneth F. Fennewald et al.
Art Unit	3742
Examiner Name	Leonid M. Fastovsky
Attorney Docket Number	7377-000005

ENCLOSURES (check all that apply)

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Fee Transmittal Form
<input checked="" type="checkbox"/> Fee Attached
<input checked="" type="checkbox"/> Amendment (18 pages)
<input type="checkbox"/> After Final
<input type="checkbox"/> Affidavits/declaration(s)
<input type="checkbox"/> Extension of Time Request
<input type="checkbox"/> Express Abandonment Request
<input type="checkbox"/> Information Disclosure Statement
<input type="checkbox"/> Certified Copy of Priority Document(s)
<input type="checkbox"/> Reply to Missing Parts/ Incomplete Application
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<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Status Letter
<input checked="" type="checkbox"/> Other Enclosure(s) (please identify below):
Check in the amount of \$450.00; and Return Receipt Postcard. |
|---|---|--|

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm	Harness, Dickey & Pierce, P.L.C.		
Signature			
Printed Name	Kelly K. Burris		
Date	July 7, 2005	Reg. No.	46,361

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name	Kelly K. Burris	Express Mail Label No.	EV 726254222 US
Signature		Date	July 7, 2005

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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EXHIBIT

D

**FEE TRANSMITTAL
for FY 2005**

Effective 10/01/2004. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT** (\$) 0

Complete if Known

Application Number	10/719,327
Filing Date	11/21/2003
First Named Inventor	Kenneth F. Fennewald et al.
Examiner Name	Leonid M. Fastovsky
Art Unit	3742
Attorney Docket No.	7377-000005

METHOD OF PAYMENT (check all that apply)		FEE CALCULATION (continued)	
<input checked="" type="checkbox"/> Check <input type="checkbox"/> Credit card <input type="checkbox"/> Money <input type="checkbox"/> Other <input type="checkbox"/> None Order		3. ADDITIONAL FEES	
<input type="checkbox"/> Deposit Account: Deposit Account Number: 08-0750 Deposit Account Name: Harness, Dickey & Pierce, P.L.C. The Director is authorized to: (check all that apply) <input type="checkbox"/> Charge fee(s) indicated below <input checked="" type="checkbox"/> Credit any overpayments <input checked="" type="checkbox"/> Charge any additional fee(s) or any underpayment of fees under 37 CFR 1.16 and 1.17 <input type="checkbox"/> Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.		Large Entity Small Entity	
1. BASIC FILING FEE		Fee Code Fee (\$)	
Large Entity Small Entity		Fee Code Fee (\$)	
Fee Code (\$)		Fee Description	
Fee Paid		Fee Paid	
1011 300 2011 150 Utility filing fee		1051 130 2051 65 Surcharge - late filing fee or oath	
1012 200 2012 100 Design filing fee		1052 50 2052 25 Surcharge - late provisional filing fee or cover sheet.	
1013 200 2013 100 Plant filing fee		1053 130 2053 130 Non-English specification	
1014 300 2014 150 Reissue filing fee		1812 2,520 1812 2,520 For filing a request for reexamination	
1005 200 2005 100 Provisional filing fee		1804 920* 1804 920* Requesting publication of SIR prior to Examiner action	
SUBTOTAL (1) (\$ 0)		1805 1,840* 1805 1,840* Requesting publication of SIR after Examiner action	
2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE		1251 120 2251 60 Extension for reply within first month	
Total Claims -20 ** = 0 X Fee from below = 0		1252 450 2252 225 Extension for reply within second month	
Independent Claims -3 ** = 0 X Fee from below = 0		1253 1020 2253 510 Extension for reply within third month	
Multiple Dependent = 0		1254 1,590 2254 795 Extension for reply within fourth month	
Large Entity Small Entity		1255 2,160 2255 1080 Extension for reply within fifth month	
Fee Code (\$)		1401 500 2401 250 Notice of Appeal	
Fee Code (\$)		1402 500 2402 250 Filing a brief in support of an appeal	
Fee Description		1403 1000 2403 500 Request for oral hearing	
1202 50 2202 25 Claims in excess of 20		1452 500 2452 250 Petition to revive - unavoidable	
1201 200 2201 100 Independent claims in excess of 3		1453 1500 2453 750 Petition to revive - unintentional	
1203 360 2203 180 Multiple dependent claim, if not paid		1501 1400 2501 700 Utility issue fee (or reissue)	
1204 200 2204 100 ** Reissue independent claims over original patent		1502 800 2502 400 Design issue fee	
1205 50 2205 25 ** Reissue claims in excess of 20 and over original patent		1460 130 1460 130 Petitions to the Commissioner	
SUBTOTAL (2) (\$ 0)		1807 50 1807 50 Processing fee under 37 CFR 1.17 (q)	
**or number previously paid, if greater; For Reissues, see above		1806 180 1806 180 Submission of Information Disclosure Stmt	
		8021 40 8021 40 Recording each patent assignment per property (times number of properties)	
		1809 790 2809 395 Filing a submission after final rejection (37 CFR § 1.129(a))	
		1810 790 2810 395 For each additional invention to be examined (37 CFR § 1.129(b))	
		1801 790 2801 395 Request for Continued Examination (RCE)	
		Other fee (specify) _____	
		*Reduced by Basic Filing Fee Paid SUBTOTAL (3) (\$ 450)	
		4. SEARCH/EXAMINATION FEES	
		1111 500 2111 250 Utility Search Fee	
		1112 100 2112 50 Design Search Fee	
		1113 300 2113 150 Plant Search Fee	
		1114 500 2114 250 Reissue Search Fee	
		1311 200 2311 100 Utility Examination Fee	
		1312 130 2312 65 Design Examination Fee	
		1313 160 2313 80 Plant Examination Fee	
		1314 600 2314 300 Reissue Examination Fee	
		SUBTOTAL (4) (\$ 0)	

SUBMITTED BY		Complete (if applicable)	
Name (Print/Type)	Kelly K. Burns	Registration No. (Attorney/Agent)	46,361
Signature	<i>Kelly K. Burns</i>	Telephone	(314) 726-7500
		Date	July 7, 2005

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service on July 7, 2005, with sufficient postage as first class mail (including Express Mail per MPEP § 512), and addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.


Kelly K. Burris, Registration No. 46,361

Application No.: 10/719,327
Filing Date: 11/21/2003
Applicants: Kenneth F. Fennewald et al.
Group Art Unit: 3742
Examiner: Leonid M. Fastovsky
Title: TWO-WIRE LAYERED HEATER SYSTEM
Attorney Docket: 7377-000005

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AND PETITION FOR EXTENSION OF TIME

In response to the Office Action mailed February 15, 2005 and to the on-site interview conducted with the Examiner on June 14, 2005, please amend the application as follows and consider the remarks set forth below.

Applicant hereby petitions under the provisions of 37 C.F.R. § 1.136(a) for an extension of time in which to respond to the outstanding Office Action and includes a fee as set forth in 37 C.F.R. § 1.17(a) with this response for such extension of time.

Amendments to the Specification begin on page 3 of this paper.

Amendments to the Claims begin on page 5 of this paper.

Remarks begin on page 11 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please delete the Abstract Section of the specification and replace it with the following abstract in marked up form. Additionally, in accordance with 37 C.F.R. § 1.72, a replacement abstract in clean form is provided on the following page, which is page 4 of this paper.

ABSTRACT OF THE DISCLOSURE

A heater system is provided ~~that comprises~~ with a layered heater in communication with a two-wire controller, wherein a resistive layer of the layered heater is both a heater element and a temperature sensor. The two-wire controller thus determines temperature of the layered heater using the resistance of the resistive layer and controls heater temperature through a power source. Furthermore, a heater system using a layered heater in communication with a two-wire controller for a specific application of a hot runner nozzle in an injection molding system is provided by the present invention.

ABSTRACT OF THE DISCLOSURE

A heater system is provided with a layered heater in communication with a two-wire controller, wherein a resistive layer of the layered heater is both a heater element and a temperature sensor. The two-wire controller thus determines temperature of the layered heater using the resistance of the resistive layer and controls heater temperature through a power source. Furthermore, a heater system using a layered heater in communication with a two-wire controller for a specific application of a hot runner nozzle in an injection molding system is provided by the present invention.

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

- 1-5. Cancelled.
6. (Currently Amended) A heater system comprising:
a substrate disposed proximate a part to be heated;
a layered heater disposed proximate the substrate, the layered heater
comprising:
at least one dielectric layer;
at least one resistive layer disposed on the dielectric layer, the
resistive layer having sufficient temperature coefficient of resistance characteristics
such that the resistive layer is a heater element and a temperature sensor; ~~[[and]]~~
two electrical lead wires connected to the resistive layer; and
a two-wire controller connected to the resistive layer through the two
electrical lead wires, wherein the two-wire controller determines temperature of the
layered heater using the resistance of the resistive layer and controls heater
temperature accordingly through the two electrical lead wires, wherein the heater
system provides heat to the part to be heated.
7. (Original) The heater system according to Claim 6; wherein the two-wire controller comprises a DC bias control for calculation of the resistance of the resistive layer.

8. (Original) The heater system according to Claim 6, wherein the two-wire controller comprises an AC bias control for calculation of the resistance of the resistive layer.

9. (Original) The heater system according to Claim 6, wherein the two-wire controller comprises high conduction angle firing.

10. (Original) The heater system according to Claim 6, wherein the two-wire controller comprises a shunt resistor for calculation of the resistance of the resistive layer.

11. (Original) The heater system according to Claim 6, wherein the two-wire controller further comprises a microprocessor.

12. (Withdrawn) The heater system according to Claim 6, wherein the resistive layer defines a pattern selected from the group consisting of spiral, rectangular, and circular.

13. (Original) The heater system according to Claim 6, wherein the two-wire controller further comprises firmware.

14. Cancelled.

15. (Withdrawn) A hot runner nozzle heater system comprising:
at least one hot runner nozzle;
a substrate disposed proximate the hot runner nozzle;
a dielectric layer disposed on the substrate;

a resistive layer disposed on the dielectric layer, the resistive layer having sufficient temperature coefficient of resistance characteristics such that the resistive layer is a heater element and a temperature sensor;

a protective layer disposed over the resistive layer; and

a two-wire controller connected to the resistive layer, wherein the two-wire controller determines temperature of the heater system using the resistance of the resistive layer and controls heater system temperature accordingly.

16. (Withdrawn) A hot runner nozzle heater system comprising:

at least one hot runner nozzle; and

at least one resistive layer disposed proximate the runner nozzle, the resistive layer having sufficient temperature coefficient of resistance characteristics such that the resistive layer is a heater element and a temperature sensor; and

a two-wire controller connected to the resistive layer, wherein the two-wire controller determines temperature of the heater system using the resistance of the resistive layer and controls heater system temperature accordingly.

17. (Withdrawn) A heater system for use with an existing temperature controller having at least one temperature sensor input and a power output, the improvement comprising:

at least one layered heater, the layered heater comprising at least one resistive layer, the resistive layer having sufficient temperature coefficient of resistance

characteristics such that the resistive layer is a heater element and a temperature sensor; and

at least one two-wire module connected to the layered heater and to the temperature controller,

wherein the two-wire module determines temperature of the layered heater using the resistance of the resistive layer and transmits the temperature of the layered heater to the temperature controller input, and the temperature controller transmits the power output to the two-wire module.

18. (Withdrawn) A heater system comprising:

a layered heater comprising at least one resistive layer, the resistive layer having sufficient temperature coefficient of resistance characteristics such that the resistive layer is a heater element and a temperature sensor;

an electrical lead connected to the resistive layer;

a controller connected to the resistive layer through the electrical lead, wherein the controller determines temperature of the layered heater using the resistance of the resistive layer and controls heater temperature accordingly;

a common return device connected to the layered heater; and

a power source connected to the controller,

wherein the common return device provides an electrical return to the controller from the layered heater.

19. (Currently Amended) A method of operating a layered heater comprising the steps of:

placing a substrate proximate a part to be heated;

supplying power to the layered heater through ~~a set of~~ two electrical leads lead wires to a resistive layer of the layered heater;

transferring heat from the resistive layer, through a dielectric layer of the layered heater, and to the substrate; and

calculating the temperature of the resistive layer using a two-wire controller connected to the layered heater through the ~~set of~~ two electrical leads lead wires,

wherein the resistive layer is a heater element and a temperature sensor.

20. (Original) The method according to Claim 19, further comprising the step of resistance data calibration.

21. (Original) The method according to Claim 19, further comprising the step of lead wire calibration.

22. (Original) The method according to Claim 19, further comprising the step of temperature calibration.

23. (Original) The method according to Claim 19, further comprising the step of TCR calibration.

24. (Withdrawn) A method of operating a layered heater in conjunction with a hot runner nozzle system comprising the steps of:

supplying power to the layered heater through a set of electrical leads to a resistive layer of the layered heater; and

calculating the temperature of the resistive layer using a two-wire controller connected to the layered heater through the set of electrical leads,

wherein the resistive layer is a heater element and a temperature sensor.

25. (New) The heater system according to Claim 6, wherein the layered heater is selected from a group consisting of thick film, thin film, thermal spray, and sol-gel.

REMARKS

Claims 1-24 remain pending in the present application. Claims 12, 15-18, and 24 are withdrawn from consideration and Claims 1-11, 13, 14, and 19-23 stand rejected. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

SPECIFICATION

The specification stands objected to for including the word “comprises” in the abstract.

Applicants respectfully disagree with the objection to the abstract, since the word “comprises” is used to indicate what elements make up the heater system. The heater system comprises or includes certain elements as specifically stated in the abstract. According to The American Heritage® Dictionary of the English Language (4th Ed. 2000), “extraneous” is defined as “not constituting a vital element or part”; “inessential or unrelated to the topic or matter at hand”; and “irrelevant.” However, removal of this word “comprises” would render this first sentence incomplete and grammatically incorrect without a proper verb. MPEP §608.01(b) states that the abstract should enable the reader to “determine quickly from a cursory inspection of the nature and gist of the technical disclosure.” Applicants submit that there is nothing “extraneous” about the word “comprises” as used in the abstract as a reader who is familiar with the English language can easily determine the nature and gist of the technical disclosure, as evidenced by the fact that this abstract was read and understood by each of the inventors in the present application.

Furthermore, Applicants conducted a search of abstracts containing the word "comprises" for all issued patents since 1976 and have found that almost four hundred thousand (400,000) patents contain this word and forms thereof in their abstracts. Clearly, the USPTO would not issue so many patents if the use of such a word was "extraneous" and improper under the rules.

However, in the interest of expediting prosecution of the present application, Applicants have amended the abstract herein and thus respectfully request that the outstanding objection be withdrawn.

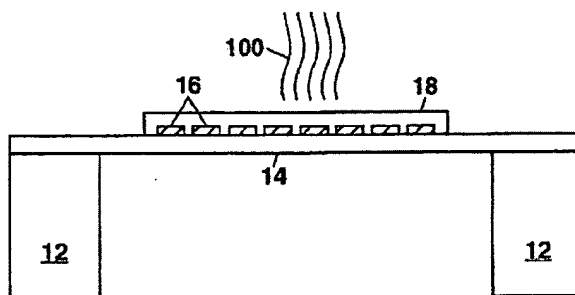
INTERVIEW SUMMARY

As a result of the on-site interview conducted between Applicants' representative and the Examiner, the claim rejections in the Outstanding Office Action have been overcome. (See attached copy of Interview Summary). During the interview, the Examiner presented new art to the Applicants' representative, which is addressed herein in accordance with the Interview Summary.

NEW ART

6,171,378 (Manginell et al.): Manginell et al. discloses a chemical preconcentrator that functions to selectively sorb one or more chemical species of interest over a time period, thereby concentrating the chemical species in the sorptive material.

Accordingly, the heating elements 16 are formed directly onto a membrane 14, which is supported by the substrate 12, and the sorptive material 18 is formed onto the heating elements 16.



In operation, the sorptive material 18 acts to sorb and concentrate one or more chemical species of interest from an ambient or a sample vapor 100 over time and can release the chemical species in concentrated form when rapidly heated by the heating elements 16. Therefore, the apparatus of Manginell et al. is a chemical preconcentrator that is used to sorb and release chemicals rather than a heater system that is used to heat a part or device as described and claimed in the pending application. As such, Manginell et al. lacks a substrate that is disposed proximate a part to be heated, in addition to a dielectric layer formed over this substrate onto which the resistive layer is formed. Moreover, although Manginell et al. discloses measuring temperature by monitoring the resistance of the heating element 16, there is a clear absence of any specific teaching or suggestion of a two-wire controller connected to the heating element 16 with only two electrical lead wires. Manginell et al. is silent as to the number of wires and as to the specifics of any controller, not to mention how a controller communicates with the heating element 16.

Accordingly, Independent Claim 6 has been amended to include the additional limitations of a substrate disposed proximate a part to be heated, a dielectric layer, and

two electrical lead wires that connect the two-wire controller to the resistive layer, wherein the claimed heater system provides heat to the part to be heated. Since Manginell et al. discloses a chemical preconcentrator, where there is no part to be heated but rather chemical species to be concentrated, Applicants submit that the claimed heater system is patentable over the Manginell et al. reference. Furthermore, since Manginell et al. is directed to a chemical preconcentrator and lacks many of the elements of the claimed invention, there can be no motivation to combine Manginell et al. with the references previously cited or with those addressed below. For at least these reasons, Applicants submit that amended Claim 6 is now patentable over the cited references and respectfully request that this claim be allowed.

Additionally, Claims 1-5, which recited different types of layered heaters (thick film, thin film, thermal spray, and sol-gel) in independent form, have been cancelled, with prejudice, and new Claim 25 has been added, which depends from Claim 6, to include these different types of layered heaters in dependent form. Therefore, Claims 7-13 and 25 depend from Claim 6 and are patentable over the cited references for at least the reasons stated above in connection with Claim 6. Accordingly, Applicants respectfully request that these claims now be allowed.

Independent method Claim 19 has also been amended in accordance with amended Claim 6, and thus Applicants submit that the claimed method is also patentable over the Manginell et al. reference and any combination of Manginell et al. with the other cited references in the present application. Claims 20-23 depend from Claim 19 and are also patentable over the cited references for at least the reasons

stated above in connection with Claim 19. Accordingly, Applicants respectfully request that these claims now be allowed.

Claim 14 has also been cancelled, with prejudice.

6,198,099 (Kim): Kim discloses a bolometer, which is essentially a device that detects energy based upon a change in the resistance of materials. Although this reference discloses a thin film resistive layer 121 having a relatively high temperature coefficient of resistance (TCR), there is no teaching whatsoever of any kind of heater device. There is no substrate, no part to be heated, nor is there a disclosure or teaching of the elements in the claimed invention, most notably, a resistive layer that is both a heater element and a temperature sensor, and a two-wire controller. Therefore, Applicants submit that the amended claims in the present application are patentable over Kim since Kim is wholly lacking the elements of the claimed heater system and method. Since Kim is directed to a bolometer, and not to a heating device, there can be no motivation to combine this reference with other references directed to heating devices, and thus Applicants respectfully submit that Kim is not germane to the claimed invention. Accordingly, Applicants submit that the amended claims are patentable over Kim for at least these reasons.

20030231415 (Puerto): Puerto discloses a lithography mirror that specifically describes the use of discrete temperature sensors, "Mirror temperature sensor 445" (Page 3, Paragraph [0049]), which can be "at least one infrared detector" or "a thermocouple" (Paragraph [0050]). With its extensive disclosure of discrete

temperature sensors, Puerto cannot teach or suggest using a resistive element as both a heater element and a temperature sensor. Additionally, Applicants submit that Puerto teaches away from the claimed invention with the use of these discrete temperature sensors.

Puerto cites the use of a TCR material "high enough to provide temperature feedback" for the resistive layer in Claims 19 and 43. With the detailed disclosure of discrete temperature sensors throughout Puerto, Applicants submit that the disclosure of a high TCR material is simply providing an improved response time of the resistive layer to temperature variations, not so that the resistive layer is both a heater element and a temperature sensor. Since Puerto is directed to a lithography mirror, the temperature must be controlled such that the temperature "is maintained constant over time." (Paragraph [0008]). As such, it would be desirable to compensate for any variation in temperature as quickly as possible, thus supporting the use of a TCR material "high enough to provide temperature feedback" for an improved response time.

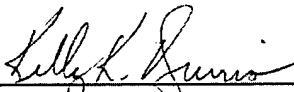
Moreover, there is no support in the specification of Puerto for the use of TCR in Claims 19 and 43, as these claims are the only place where TCR is mentioned. Therefore, there is no specific teaching in Puerto as to how the TCR material is used and one skilled in the art is left to conjecture to determine its application. Additionally, since Puerto is directed to a lithography mirror, there is no substrate disposed proximate a part to be heated. For at least these reasons, Applicants submit that the amended claims are patentable over the Puerto reference and any combination of Puerto with the other cited references in the present application.

CONCLUSION

It is believed that all of the stated grounds of objection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding objections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (314) 726-7524.

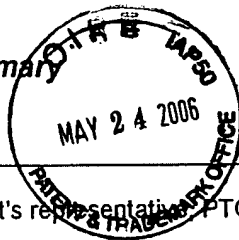
Respectfully submitted,

Dated: 07 JUL 05

By: 
Kelly K. Burris
Reg. No. 46,361

HARNESS, DICKEY & PIERCE, P.L.C.
7700 Bonhomme Rd.
Suite 400
St. Louis, MO 63105
(314) 726-7500

Interview Summary



Application No.

10/719,327

Applicant(s)

FENNEWALD ET AL

Examiner

Leonid M. Fastovsky

Art Unit

3742

All participants (applicant, applicant's representative, PTO personnel):

(1) Leonid M. Fastovsky.

(3) _____.

(2) Kelly Burris.

(4) _____.

Date of Interview: 14 June 2005.

Type: a) ☐ Telephonic b) ☐ Video Conference

c) ☒ Personal [copy given to: 1) ☐ applicant 2) ☒ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☐ No.

If Yes, brief description: _____.

Claim(s) discussed: 1-11, 13, 14 and 19-23.

Identification of prior art discussed: 6171379, 6198099, 20030231415

Agreement with respect to the claims f) ☐ was reached. g) ☐ was not reached. h) ☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: The applicant arguments have overcome the prior art rejection based on 5505307, however examiner has presented a new art (listed above) and the applicant will consider them in her response.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Leonid M. Fastovsky
Examiner's signature, if required

Applicant: Kenneth F. Fennewald et al.		Client Matter #	7377-000005/US
Serial/Patent #	10/719,327	Filing/Issue Date	November 21, 2003
Title: Two-Wire Layered Heater System			
Please acknowledge receipt of:			
Transmittal (1 page); Fee Transmittal (1 page); Amendment and Petition for Extension of Time (18 pages); and Check in the amount of \$450.00.			
Express Mail Label No.: EV 726254222 US		USPTO Date Stamp	
By stamping and returning to Harness, Dickey & Pierce, P.L.C.		Mailed:	
July 7, 2005		Attorney: Kelly K. Burris/lrs	



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7377-000005/WS

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,327	11/21/2003	Kenneth F. Fennewald	7377-000005/US	2615

28997 7590 09/30/2005

HARNESS, DICKEY, & PIERCE, P.L.C.
7700 BONHOMME, STE 400
ST. LOUIS, MO 63105

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HARNESS, DICKEY & PIERCE
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EXAMINER

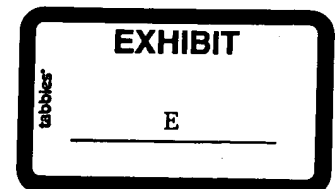
FASTOVSKY, LEONID M

ART UNIT PAPER NUMBER

3742

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.



Office Action Summary

7377-000005/US

Application No.

10/719,327

Applicant(s)

FENNEWALD ET AL.

Examiner

Leonid M. Fastovsky

Art Unit

3742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

RECEIVED
OCT 05 2005

HARNES DICKY & PIERCE
ST. LOUIS, MISSOURI

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 13, 14 and 19-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 13, 14 and 19-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 3-4, 6-8 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner et al (DE019745966) in view of Haas.

Brueckner discloses an inherently thin film heater comprising at least a resistive layer with adjustable temperature coefficient of resistance (TCR), the resistive layer made out of Cu-Ni (Abstract), thus the resistive layer is a heater element and a temperature sensor, but does not disclose how the temperature is adjusted and a two-wire controller. Haas discloses a heater element 10 comprising a conductive ink 12, a temperature controller 30 having two wires 26 and connected to the resistive layer of the heater 10 (col. 7, lines 10-45). It would have been obvious to one having ordinary skill in the art to modify Brueckner's invention to include a temperature controller as taught by Haas, wherein the controller determines temperature of the thin film heater using the resistance of the resistance layer of the Brueckner and controls the heater temperature accordingly.

As for claim 4, this is a product -by-process claim, and the product itself does not depend on the process of making it. See MPEP 2113.

As for claims 7-8, Haas teaches a film heater 10 comprising a controller 30 capable of operating with DC or AC control. It would have been obvious to one having ordinary skill in the art to modify Brueckner's invention to use a controller with AC or DC control as taught by Haas in order to control calculation of the resistance of the resistive layer of Brueckner.

As for claim 19, Brueckner in view of Haas can use the method of operating the heater because they disclose all structural elements of the invention and are capable of so perform.

As for claims 20-23, it would have been obvious to one having ordinary skill in the art to modify the invention of Brueckner in view of Haas to include calibration steps in order to better control the heater temperature.

3. Claims 1-2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner in view of Haas and further in view of Hayashi.

Brueckner in view of Haas discloses substantially the claimed invention comprising an inherently thick film heater of Brueckner and a substrate 18 of Haas, but does not disclose a dielectric layer and a protective layer.

Hayashi discloses a heater system (Fig. 4) comprising a film heater defining a substrate 2, a dielectric layer 4, a resistive layer 5a, a protective layer 6, and a two-wire controller 61. It would have been obvious to one having ordinary skill in the art to modify the invention of Brueckner in view of Haas to include a dielectric layer and a protective layer as taught by Hayashi in order to protect the user from being hurt by an electric current.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner in view of Haas and further in view of Miyata et al.

Brueckner in view of Haas discloses substantially the claimed invention, but does not disclose a sol-gel heater and thermal spray. Miyata teaches a sol-gel heater (col. 10, lines 10-20) and thermal spray (col. 20, lines 36-44). It would have been obvious to one having ordinary skill in the art to modify the invention of Brueckner in view of Haas to include a sol-gel heater in order to protect the exposed edge from the outside covering with a ceramic film as taught by Miyata (col. 10, lines 12-17).

5. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner in view of Haas and further in view of Lumsden.

Brueckner in view of Haas discloses substantially the claimed invention, but does not disclose a controller having an angle firing and a shunt resistor. Lumsden teaches a controller 8 comprises an angle firing (col. 7, lines 1-10) and shunt resistor (claim 1). It would have been obvious to one having ordinary skill in the art to modify the invention of Brueckner in view of Haas to include a controller comprising an angle firing and a shunt resistor for controlling current as taught by Lumsden (col. 6, lines 55-67).

6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner in view of Haas and further in view of Waggoner et al.

Brueckner in view of Haas discloses substantially the claimed invention, but does not disclose a controller with firmware. Waggoner teaches a heater resistor having a controller 80 comprising firmware. It would have been obvious to one having ordinary skill in the art to modify the invention of Brueckner in view of Haas to include a controller

comprising firmware in order to control various functions as taught by Waggoner (col. 2, lines 63-67).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brueckner in view of Haas and further in view of Godwin.

Brueckner in view of Haas discloses substantially the claimed invention including a controller, but does not disclose a microprocessor. Godwin discloses a heater system comprising film heaters 63,65 and 67, a controller and a microprocessor (col. 7, lines 15-30). It would have been obvious to one having ordinary skill in the art to modify Hayashi's invention to include a microprocessor as taught by Godwin in order to carry logic operation means (col. 7, lines 16-23) that are applied to operating of the heater of Brueckner in view of Haas.

Response to Arguments

8. Applicant's arguments with respect to claims 1-11, 13-14 and 19-23 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid M Fastovsky whose telephone number is 571-272-4778. The examiner can normally be reached on M-Th. 8.00 am -6.00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Art Unit: 3742

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

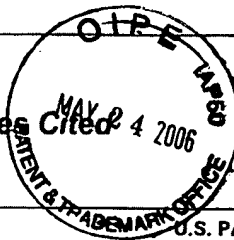

Leonid M Fastovsky
Examiner
Art Unit 3742

Imf

9/13/05


ROBIN D. EVANS
SENIOR EXAMINER
9/19/05

Notice of References Cited



Application/Control No.

10/719,327

Applicant(s)/Patent Under
Reexamination
FENNEWALD ET AL.

Examiner

Leonid M. Fastovsky

Art Unit

3742

Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	DE019745966	10-1998	Germany	Brueckner et al	H01C 7/06
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

PUB-NO: DE019745966C1

**DOCUMENT-
IDENTIFIER:** DE 19745966 C1

TITLE: Low ohmic resistive layer of copper@-
nickel@ alloy

PUBN-DATE: October 29, 1998

INVENTOR-INFORMATION:

NAME	COUNTRY
-------------	----------------

BRUECKNER, WINFRIED DR	DE
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REISS, GUENTER DR	DE
-------------------	----

BAUNACK, STEFAN DR	DE
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VOGEL, REGINA	DE
---------------	----

ASSIGNEE-INFORMATION:

NAME	COUNTRY
-------------	----------------

DRESDEN EV INST FESTKOERPER	DE
-----------------------------	----

APPL-NO: DE19745966

APPL-DATE: October 17, 1997

PRIORITY-DATA: DE19745966A (October 17, 1997)

INT-CL (IPC): H01C007/06 , H01C017/08 , C23C014/14

EUR-CL **C23C014/14 , H01C007/06 , H01C017/08 ,**
(EPC): **H01C017/26**

ABSTRACT:

CHG DATE=19990905 STATUS=O>A low ohmic resistive layer, with adjustable low temperature coefficient of resistance (TCR), consists of a Cu-Ni based alloy applied without underlying and/or cover layers onto a substrate, the TCR being determined by the thickness of an oxide layer formed on the resistive layer. Preferably, the resistive layer comprises a sputter deposited alloy containing 30-60 wt.% Ni, 40-70 wt.% Cu and optionally up to 10 wt.% total of one or more transition metals and the oxide layer is formed to a thickness of 1-20% of the total layer thickness by heat treating at 300-500 deg C in an oxygen-containing atmosphere.



① BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
PATENTAMT

⑫ Patentschrift
⑩ DE 197 45 966 C 1

⑤ Int. Cl.⁸
H 01 C 7/06
H 01 C 17/08
C 23 C 14/14

⑦ Aktenzeichen: 197 45 966.8-34
② Anmeldetag: 17. 10. 97
④ Offenlegungstag: -
④ Veröffentlichungstag
der Patenterteilung: 29. 10. 98

DE 197 45 966 C 1

Innerhalb von 3 Monaten nach Veröffentlichung der Erteilung kann Einspruch erhoben werden

⑦ Patentinhaber:

Institut für Festkörper- und Werkstofforschung
Dresden e.V., 01069 Dresden, DE

⑦ Erfinder:

Brückner, Winfried, Dr.habil., 01307 Dresden, DE;
Reiss, Günter, Dr.habil., 33602 Bielefeld, DE;
Baunack, Stefan, Dr., 01159 Dresden, DE; Vogel,
Regina, 01169 Dresden, DE

⑤ Für die Beurteilung der Patentfähigkeit in Betracht
gezogene Druckschriften:

DD 2 92 340 A5

NISHINO, I. (u.a.): Evaluation of Cu-Ni Alloy
as a Material of Thin Film Resistors. In: The
International Journal for Hybrid Microelec-
tronics, Vol. 8, Number 1, March 1985, S. 18-23;
BRÜCKNER, W. (u.a.): Adjustment of temperature
coefficient of resistance in NiCr/CuNi(Mn)/NiCr
films. In: J.Appl.Phys. 79 (11), 1 June 1996,
S. 8516-8520;

⑤ Niederohmige Widerstandsschicht

⑦ Die Erfindung betrifft eine niederohmige Widerstands-
schicht mit einstellbarem kleinen Temperaturkoeffizien-
ten des elektrischen Widerstands (TKR).
Der Erfindung liegt die Aufgabe zugrunde, eine niederoh-
mige Widerstandsschicht auf CuNi-Basis zu schaffen, die
als Einzelschicht, d. h. ohne eine Unterlage- und/oder
Deckschicht aus dem System Ni und Cr, einen einstellba-
ren kleinen TKR ermöglicht.
Erfindungsgemäß besteht die Widerstandsschicht aus ei-
ner CuNi-Basis-Legierung, die unter Vermeidung einer
Unterlage- und/oder Deckschicht auf einem Trägerkörper
aufgebracht ist, wobei auf der Widerstandsschicht eine
Oxidschicht erzeugt ist. Über die Oxidschichtdicke kann
der TKR eingestellt werden. Mit zunehmender Oxid-
schichtdicke verschiebt sich der TKR von negativen Wer-
ten, wie sie zunächst nach der Schichtabscheidung vor-
handen sind, zu positiven Werten.
Die Schicht ist beispielsweise für Chipwiderstände und
Axialwiderstände anwendbar.

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Beschreibung

Die Erfindung bezieht sich auf das Gebiet der Elektrotechnik/Elektronik und betrifft eine niederohmige Widerstandsschicht mit einstellbarem kleinen Temperaturkoeffizienten des elektrischen Widerstands (TKR). Die Schicht ist beispielsweise für Chipwiderstände und Axialwiderstände anwendbar.

Es sind bereits verschiedene Legierungen und Schichtsysteme für niederohmige Widerstandsschichten bekannt. Die vielfach benutzten NiCr-Schichten eignen sich gut für Flächenwiderstände größer als 5 Ohm/q, nicht aber für Werte darunter. Für diesen Bereich sind auch Niederohmwiderstandsschichten auf CuNi-Basis bekannt (J. Nishino, Y. Ichinose, Y. Sorimachi und I. Tsubata, Int. J. Hybrid Microelectron. 8, 1, 5, 12 (1985)).

Bekannt sind auch Niederohmwiderstandsschichten auf CuNi-Basis mit geringen Anteilen von Übergangsmetallen, beispielsweise mit 1% Mn (DD 292 340). Die Schichten können durch Sputtern auf ein isolierendes Substrat, z. B. auf Aluminiumoxid-Keramik oder oxidierten Si-Scheiben, abgeschieden werden. Die Schichten besitzen eine Unterlage- und/oder Deckschicht aus NiCr.

Für Widerstandsschichten, die Präzisionsanforderungen genügen sollen, ist ein kleiner TKR erforderlich. Dabei sollte der TKR-Wert einstellbar veränderlich sein, um ihn speziellen Anwenderanforderungen anpassen zu können oder um Kontakt- und andere Einflüsse auf den TKR korrigieren zu können.

Die TKR-Einstellung wird meist über eine Wärmebehandlung deutlich oberhalb der maximalen Einsatztemperatur realisiert. Diese Wärmebehandlung erfolgt in inerte oder reduzierender Atmosphäre, z. B. in einem Formiergas, das aus einem Stickstoff-Wasserstoff-Gemisch besteht (DD 292 340).

Werkstoffwissenschaftliche Untersuchungen an CuNiMn-Einzelschichten der Zusammensetzung $\text{Cu}_{57}\text{Ni}_{42}\text{Mn}_1$ (W. Brückner, St. Baunack, D. Elefant und G. Reiss, J. Appl. Phys. 79, S. 8516 (1996)) haben ergeben, daß bei Wärmebehandlung in Formiergas bis 550°C praktisch keine Änderung des TKR auftritt und daß es erst durch die Unterlage- und/oder Deckschicht aus NiCr möglich wird, eine Verschiebung des TKR bei einer Wärmebehandlung zu erreichen. Der TKR der abgeschiedenen Schicht ist negativ, er verschiebt sich durch die Wärmebehandlung zu positiven Werten. Dabei gibt es Reaktionen zwischen den zwei Teilschichten NiCr und CuNi (Mn).

Nachteilig hierbei ist, daß das niederohmige Widerstandsschichtmaterial nur in Verbindung mit NiCr-Unterlage- und/oder Deckschichten die Einstellung eines kleinen TKR-Wertes ermöglicht. Durch die notwendige Abscheidung eines Schichtsystems entsteht ein hoher Aufwand bei der Beschichtung.

Der Erfindung liegt die Aufgabe zugrunde, eine niederohmige Widerstandsschicht auf CuNi-Basis zu schaffen, die als Einzelschicht, d. h. ohne eine Unterlage- und/oder Deckschicht aus dem System Ni und Cr, einen einstellbaren kleinen TKR ermöglicht.

Diese Aufgabe ist mit der in den Patentansprüchen beschriebenen Widerstandsschicht gelöst.

Dabei besteht die erfindungsgemäße Widerstandsschicht aus einer CuNi-Basis-Legierung, die unter Vermeidung einer Unterlage- und/oder Deckschicht auf einem Trägerkörper aufgebracht ist, wobei auf der Widerstandsschicht eine Oxidschicht erzeugt ist. Über die Oxidschichtdicke kann der TKR eingestellt werden. Mit zunehmender Oxidschichtdicke verschiebt sich der TKR von negativen Werten, wie sie zunächst nach der Schichtabscheidung vorhanden sind,

zu positiven Werten.

Die CuNi-Basis-Legierung kann zweckmäßigerweise 30 bis 60 Gew.-% Ni, 40 bis 70 Gew.-% Cu und einen möglichen Zusatz von insgesamt bis zu 10 Gew.-% eines oder mehrerer Übergangsmetalle enthalten. Die Schicht kann aus der Legierung mittels Sputtern auf dem Trägerkörper erzeugt worden sein.

Die Oxidschicht kann mittels einer Wärmebehandlung im Temperaturbereich von 300 bis 500°C in sauerstoffhaltiger Atmosphäre gebildet worden sein. Als sauerstoffhaltige Atmosphäre kann Luft, ein Inertgas mit Sauerstoff- oder Luftzugabe oder auch ein technisches Inertgas mit Restsauerstoff verwendet werden.

Die Dicke der Oxidschicht kann 1% bis 20% der gesamten Schichtdicke betragen.

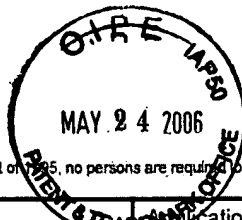
Der Vorteil der Erfindung gegenüber dem Stand der Technik besteht darin, daß nur eine Einzelschicht aus einem Material auf CuNi-Basis abgeschieden zu werden braucht. Dadurch wird gegenüber der Mehrschichtabscheidung mit zusätzlichem NiCr eine apparative und technologische Vereinfachung erreicht, wenn eine niederohmige Widerstandsschicht mit einem einstellbaren kleinen TKR benötigt wird.

Die Erfindung ist nachfolgend an Hand eines Ausführungsbeispiels näher erläutert.

Eine CuNiMn-Einzelschicht der Zusammensetzung $\text{Cu}_{59}\text{Ni}_{40}\text{Mn}_1$ wird durch Sputtern auf einem oxidierten Silizium-Substrat hergestellt. Die erzeugte Schicht besitzt eine Dicke von 410 nm, einen Flächenwiderstand von 1,25 Ohm/q und einen TKR-Wert von -54 ppm/K. Nach einer Wärmebehandlung in Argon mit einem Zusatz von 50 vol.-ppm Luft bei 400°C über 0,5 h hat sich auf der Schicht eine Oxidschicht aus dem Schichtmaterial gebildet, die eine Dicke von ≈ 30 nm besitzt. Der Flächenwiderstand hat sich um etwa 5% verringert, der TKR-Wert beträgt +5 ppm/K.

Patentansprüche

1. Niederohmige Widerstandsschicht mit einstellbarem kleinen Temperaturkoeffizienten des elektrischen Widerstands TKR, dadurch gekennzeichnet, daß die Widerstandsschicht aus einer CuNi-Basis-Legierung besteht, die unter Vermeidung einer Unterlage- und/oder Deckschicht auf einem Trägerkörper aufgebracht ist, wobei auf der Widerstandsschicht eine Oxidschicht erzeugt ist, deren Dicke den TKR bestimmt.
2. Niederohmige Widerstandsschicht nach Anspruch 1, dadurch gekennzeichnet, daß die CuNi-Basis-Legierung 30 bis 60 Gew.-% Ni, 40 bis 70 Gew.-% Cu und einen möglichen Zusatz von insgesamt bis zu 10 Gew.-% eines oder mehrerer Übergangsmetalle enthält.
3. Niederohmige Widerstandsschicht nach Anspruch 1, dadurch gekennzeichnet, daß die CuNi-Schicht mittels Sputtern auf dem Trägerkörper erzeugt ist.
4. Niederohmige Widerstandsschicht nach Anspruch 1, dadurch gekennzeichnet, daß die Oxidschicht mittels einer Wärmebehandlung im Temperaturbereich von 300 bis 500°C in sauerstoffhaltiger Atmosphäre gebildet ist.
5. Niederohmige Widerstandsschicht nach Anspruch 1, dadurch gekennzeichnet, daß die Dicke der Oxidschicht 1% bis 20% der gesamten Schichtdicke beträgt.



PTO/SB/21 (04-04)

Approved for use through 07/31/2006. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM (to be used for all correspondence after initial filing)		Application Number	10/719,327
		Filing Date	11/21/2003
		First Named Inventor	Kenneth F. Fennewald
		Art Unit	3742
		Examiner Name	Leonid M. Fastovsky
Total Number of Pages in This Submission	16	Attorney Docket Number	7377-000005

ENCLOSURES (check all that apply)				
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment / Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Response to Missing Parts/Incomplete Application <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____	<input type="checkbox"/> After Allowance Communication to Technology Center (TC) <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input checked="" type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Copy of English translation of DE 197 45 966 C1 (6 pages) RETURN RECEIPT POSTCARD		
<table border="1"><tr><td>Remarks</td><td>The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.</td></tr></table>			Remarks	The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.
Remarks	The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.			

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name	Bryan K. Wheelock
Reg. No.	31,441		
Signature			
Date	December 30, 2005		

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.			
Typed or printed name	Bryan K. Wheelock	Express Mail Label No.	EV 639017768 US
Signature		Date	December 30, 2005

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If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

EXHIBIT

tabbies

F



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service on December 30, 2005, with sufficient postage as first class mail (including Express Mail per MPEP § 512), and addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450


Bryan K. Wheelock, Registration No. 31,441

Application No.: 10/719,327

Filing Date: 11/21/2003

Applicants: Kenneth F. Fennewald et al.

Group Art Unit: 3742

Examiner: Leonid M. Fastovsky

Title: TWO-WIRE LAYERED HEATER SYSTEM

Attorney Docket: 7377-000005

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

RESPONSE

In response to the Office Action mailed September 30, 2005, please consider the remarks set forth below.

Remarks begin on page 2 of this paper.

REMARKS

Claims 6-11, 13, 19-23, and 25 remain pending in the present application. Claims 1-5, and 14 have previously been cancelled, and Claims 12, 15-18, and 24 have been withdrawn from consideration. Although Claims 1-5 and 14 have been cancelled, the Outstanding Office Action states that these claims are rejected. Additionally, new Claim 25 is not addressed in the Outstanding Office Action. Otherwise, Claims 6-11, 13, and 19-23 stand rejected. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 3-4, 6-8, and 19-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848). This rejection is respectfully traversed.

First of all, Claims 3-4 have previously been cancelled in the amendment filed on July 7, 2005. Therefore, the rejection of these claims is moot.

Claims 6-8 and 19-23 include a resistive layer that is both a heater element and a temperature sensor, wherein this dual-purpose resistive layer is connected to a two-wire controller through only two electrical lead wires. As described in detail below, neither Brueckner et al. nor Haas et al., either explicitly or inherently, teach or suggest the claimed invention and thus these claims cannot be obvious.

Brueckner et al.

The Outstanding Office Action relies upon an English abstract of a German publication, and based upon this limited information, incorrectly states that Brueckner et al. discloses an inherently thin film heater in which the resistive layer is a heater

element and a temperature sensor. However, Applicants have obtained a full English translation of Brueckner et al. (a courtesy copy of which is enclosed) only to discover that Brueckner et al., in fact, is not related to a heater whatsoever. Brueckner et al. is directed to a resistive layer for resistors, not for heaters. As such, there is no need for a temperature sensor, let alone a two-wire controller that controls power to a heater. In the absence of any disclosure of a heater element and a temperature sensor, Applicants submit that Brueckner et al. cannot expressly or inherently disclose a thin film heater in which the resistive layer is both a heater element and a temperature sensor.

Even more specifically, to achieve the “adjustable TKR” (TCR in English) of the resistor, Brueckner et al. adjusts the thickness of an oxide layer, (e.g., page 4, paragraph 1), during fabrication of the resistor. The resulting resistor has a fixed TCR after the desired thickness is achieved, wherein multiple resistors can be fabricated with different TCRs by adjusting the thickness of the respective oxide layers. Thus, even if Brueckner et al. were misconstrued to inherently teach a heater, the resistive layer does not have sufficient TCR characteristics to allow the layer to function as both a heater element and a temperature sensor. Additionally, Brueckner et al. discloses creating the resistive layer “without a base and/or cover layer” (See, e.g., page 1, paragraph 2), which teaches away from the use of a dielectric layer as included in the claims. Accordingly, Brueckner et al., alone or in combination with the cited references, cannot render claims 6-8 and 19-23 obvious.

With regard to the rejections based on inherency, it is the Applicant’s understanding that the Examiner “must provide rationale or evidence tending to show

inherency.” (MPEP 2112). Additionally, “In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” *Ex parte Levy*, 17 USPQ 2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). However, the Outstanding Office Action omits the required substantive reasoning in favor of a “blanket” statement that an adjustable TCR layer for a resistor is a resistive layer that is a heater element and a temperature sensor. This statement is wholly void of any technical reasoning. Therefore, Applicants respectfully submit that the inherency argument is not properly supported by the Outstanding Office Action, and in light of the arguments submitted herein, respectfully request either further technical reasoning or withdrawal of the outstanding claim rejections based on inherency. Regardless, since Brueckner et al. is limited to a resistor and does not expressly relate to a heater, it does not (and cannot) inherently teach a resistive layer that is both a heater element and a temperature sensor. Therefore, the application of Brueckner et al. to the outstanding claims is improper and Applicants respectfully request withdrawal of the outstanding claim rejections based on this reference.

Haas et al.

Haas et al. does not disclose a two-wire controller as required in Claims 6-8 and 19-23. The controller of Haas et al. is connected to the heater element with two wires, however, the mere connection of a heater element to a controller with two wires is not a two-wire controller as defined in the present application. Referring to the detailed description at paragraph [0032], “the two-wire controller 14 determines the temperature of the layered heater 12 ...then sends signals to the power source 16 to control the

temperature of the layered heater 12 accordingly. Therefore, only a single set of electrical leads 18 is required rather than one set for the heater and one set for a temperature sensor.”

More specifically, Haas et al. discloses a separate thermistor 22, which is a separate sensor that is used in conjunction with the controller to control temperature of the separate heater element. (See, e.g., Column 6, Lines 15-25). As a result, the thermistor requires thermistor wires 23 (Fig. 2, Column 7, Line 6), which renders the controller of Haas et al. a four-wire controller, not a two-wire controller. Therefore, Haas et al. teaches away from the use of a two-wire controller with its use of a separate temperature sensor having a separate set of wires. Accordingly, without any teaching or suggestion of a resistive layer that is both a heater element and a temperature sensor, and which is connected to a two-wire controller through only two electrical lead wires, Haas et al. cannot be applied to render Claims 6-8 and 19-23 obvious. Therefore, Applicants respectfully request that the outstanding claim rejections be withdrawn.

Claim 5

Claim 5 is rejected under 35 U.S.C. §103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848) and further in view of Miyata et al. As previously stated, Claim 5 has been cancelled and thus the rejection of this claim is moot.

Claims 9-10

Claims 9-10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848) and

further in view of Lumsden (U.S. Patent No. 6,489,742). Claims 9 and 10 depend from Claim 6 and distinguish over these references for at least the reasons stated above in connection with Claim 6. Therefore, Applicants respectfully request that these claim rejections be withdrawn.

Claim 13

Claim 13 is rejected under 35 U.S.C. §103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848) and further in view of Waggoner et al. Claim 13 depends from Claim 6 and distinguishes over these references for at least the reasons stated above in connection with Claim 6. Therefore, Applicants respectfully request that this claim rejection be withdrawn.

Claims 7-8

Claims 7-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848). Claims 7-8 depend from Claim 6 and distinguish over these references for at least the reasons stated above in connection with Claim 6. Therefore, Applicants respectfully request that these claim rejections also be withdrawn.

Claims 1-2 and 14

Claims 1-2 and 14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brueckner et al. (DE019745966) in view of Haas et al. (U.S. Pat. No. 6,770,848) and further in view of Hayashi. As previously stated, Claims 1-2 and 14 have been cancelled and thus the rejection of these claims is moot.


Finally, after multiple office actions, each having new grounds of rejection, a personal on-site interview with the Examiner, and the costs for translating a German language reference, Applicants are concerned that prosecution of the present application is not advancing. Therefore, Applicants have enclosed with this response a Notice of Appeal, which will be vigorously pursued in the absence of a Notice of Allowance.

CONCLUSION

It is believed that all of the stated grounds of objection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding objections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (314) 726-7505.

Respectfully submitted,

Dated: 30 DECEMBER 2006

By: 
Bryan K. Wheelock
Reg. No. 31,441

HARNESS, DICKEY & PIERCE, P.L.C.
7700 Bonhomme Rd.
Suite 400
St. Louis, MO 63105
(314) 726-7500

Translation of DE 197 45 966 C1

Abstract

Low-resistance resistive layer

The invention relates to a low-resistance resistive layer with adjustable small temperature coefficient of the electric resistance (TKR).

It is the object of the invention to provide a low-resistance resistive layer on CuNi-basis, which, as single layer, i. e. without a base and/or cover layer from the system Ni and Cr, makes possible an adjustable small TKR.

According to the invention, the resistive layer consists of a CuNi-base-alloy which under avoidance of a base and/or cover layer is applied to a supporting body, wherein on the resistive layer an oxide layer is created. Via the oxide layer thickness the TKR can be adjusted. With increasing oxide layer thickness the TKR changes from negative values, as they are initially given after the layer separation, to positive values.

The layer can be applied to chips resistors and axial resistors, e. g..

Specification

The invention relates to the field of electrical engineering/electronic and relates to a low-resistance resistive layer with adjustable small temperature coefficient of the electric resistance (TKR). The layer can be applied to chips resistors and axial resistors, e. g.

Various alloys and layer systems for low-resistance resistive layers are known. NiCr-layers which are often used are suitable for surface resistances larger than 5 Ohm/q, not, however, for lower values. For this region low-resistance resistive layers on CuNi-basis are known as well (J. Nishino, Y. Ichinose, Y. Sorimachi and I. Tsubata, Int. Hybrid Microelectron, 8, 1, 5, 12 (1985)).

Also known are low-resistance resistive layers on CuNi-basis with small fractions of transition metals, e. g. with 1% Mn (DD 292 340). The layers can be separated by sputtering onto an insulating substrate, e. g. onto aluminium oxide ceramic or oxidized Si-discs. The layers have a base and/or cover layer of NiCr.

For resistive layers which have to meet precision requirements a small TKR is necessary, wherein the TKR-value should be adjustable, in order to be able to adapt it to special use requirements or to be able to correct contact and other influences onto the TKR.

Generally, the TKR-adjustment is realized by a heat treatment distinctly above the maximal operation temperature. This heat

treatment is performed in inert or reducing atmosphere, e. g. in an anti-slag gas consisting of a nitrogen-hydrogen-mixture (DD 292 340).

Material science tests of Cu-NiMn-single layers of the composition $\text{Cu}_{57}\text{Ni}_{42}\text{Mn}_1$ (W. Brückner, St. Baunack, D. Elefant and G. Reiss, J. Appl. Phys., 79, page 8516 (1996) resulted in that with a heat treatment in anti-slag gas up to 550° C there is practically no change of the TKR and that it is only possible by means of the base and/or cover layer of NiCr to achieve a change of the TKR in case of a heat treatment. The TKR of the separated layer is negative, it changes to positive values by means of the heat treatment. This results in reactions between both partial layers NiCr and CuNi (Mn).

The disadvantage therein is that the low-resistance resistive layer material allows adjustment of a small TKR-value only in connection with NiCr-base and/or cover layers. The necessary separation of a layer system necessitates a large effort when applying layers.

It is the object of the invention to create a low-resistance resistive layer on CuNi-basis which, as single layer, i. e. without a base and/or cover layer from the system Ni and Cr, allows an adjustable small TKR.

This problem is solved by means of the resistive layer described in the patent claims.

The resistive layer according to the invention consists of a CuNi-base alloy which under avoidance of a base and/or cover

layer is applied to a supporting body, wherein on the resistive layer an oxide layer is created. By means of the oxide layer thickness the TKR can be adjusted. With increasing oxide layer thickness the TKR changes from negative values, as they are initially given after the layer separation, to positive values.

The CuNi-base alloy can contain 30 to 60 wt% Ni, 40 to 70 wt% Cu and a possible additive of at least up to 10 wt% of one or several transition metals. The layer can have been created from the alloy by means of sputtering onto the supporting body.

The oxide layer can have been formed by means of a heat treatment in the temperature range of 300 to 500° C in an oxidized atmosphere. As oxidized atmosphere air, an inert gas with oxygen or air addition or, as well, a technical inert gas with remaining oxygen can be used.

The thickness of the oxide layer can amount to 1% to 20% of the total layer thickness.

The advantage of the invention compared with the prior art is that only a single layer of a material on CuNi-basis has to be separated. This results, in contrast to a multi-layer separation with additional NiCr, in an improvement of the apparatus and of the technology, when a low-resistance layer with adjustable small TKR is required.

In the following the invention is explained in detail by means of an embodiment.

A CuNiMn-single layer of the composition $\text{Cu}_{59}\text{Ni}_{40}\text{Mn}_1$ is created on an oxidized silicon-substrate by sputtering. The created layer has a thickness of 410 nm, a surface resistance of 1,25 Ohm/ \square and a TKR-value of -54 ppm/K. After a heat treatment in Argon with an addition of 50 vol.-% air at 400°C during 0,5 h on the layer an oxide layer has formed from the layer material, having a thickness of \approx 30 nm. The surface resistance is reduced by approximately 5%, the TKR-value is +5 ppm/K.

Claims

1. Low-resistance resistive layer with adjustable small temperature coefficient of the electric resistance TKR, **characterized in that** the resistive layer consists of a CuNi-base alloy, which under avoidance of a base and/or cover layer is applied to a supporting body, wherein on the resistive layer an oxide layer is created, the thickness of which determines the TKR.
2. Low-resistance resistive layer according to claim 1, characterized in that the CuNi-base alloy contains 30 to 60 wt% Ni, 40 to 70 wt% Cu and a possible addition of totally up to 10 wt% of one or several transition alloys.
3. Low-resistance resistive layer according to claim 1, characterized in that the CuNi-layer is created by means of sputtering on the supporting body.
4. Low-resistance resistive layer according to claim 1, characterized in that the oxide layer is formed by means of a heat treatment in the temperature range of 300 to 500° C in oxidized atmosphere.
5. Low-resistance resistive layer according to claim 1, characterized in that the thickness of the oxide layer amounts to 1% to 20% of the complete layer thickness.



PTO/SB/31 (06-04)

Approved for use through 07/31/2008. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Project (06-04) of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**NOTICE OF APPEAL FROM THE EXAMINER TO
THE BOARD OF PATENT APPEALS AND INTERFERENCES**Docket Number (Optional)
7377-000005

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on December 30, 2005

Signature Bryan K. WheelockTyped or printed
name Bryan K. Wheelock

In re Application of

Kenneth F. Fennewald, et al.

Application Number

10/719,327

Filed

November 21, 2003

For **TWO-WIRE LAYERED HEATER SYSTEM**Art Unit
3742Examiner
Leonid M. Fastovsky

Applicant hereby appeals to the Board of Patent Appeals and Interferences from the decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 1.17(b))

\$ 500.☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is:

\$ ____.

☐ A check in the amount of the fee is enclosed.☐ Payment by credit card. Form PTO-2038 is attached.☐ The Director has already been authorized to charge fees in this application to a Deposit Account. I have enclosed a duplicate copy of this sheet.☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 08-0750. I have enclosed a duplicate copy of this sheet.☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

I am the

☐ applicant/inventor.☐ assignee of record of the entire interest.See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed.
(Form PTO/SB/98)☒ attorney or agent of record.Registration number 31,441☐ attorney or agent acting under 37 CFR 1.34.

Registration number if acting under 37 CFR 1.34. ____.

Bryan K. Wheelock
Signature

Bryan K. Wheelock

Typed or printed name

314-726-7500

Telephone number

December 30, 2005

Date

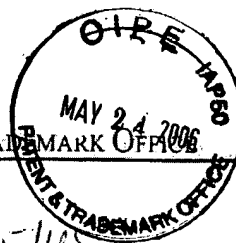
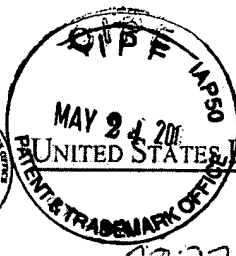
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ *Total of one (1) forms are submitted.

This collection of information is required by 37 CFR 1.191. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Applicant:	Kenneth F. Fennewald et al.	Client Matter #	7377-000005
Serial/Patent #	10/719,327	Filing/Issue Date	November 21, 2003
Title:	Two-Wire Layered Heater System		
Please acknowledge receipt of:		USPTO Date Stamp	
Transmittal (1 page);			
Response (7 pages);			
Translation of foreign reference (6 pages);			
Notice of Appeal (1 page and duplicate)			
Express Mail Label No.: EV 639017768 US			
By stamping and returning to Harness, Dickey & Pierce, P.L.C.			
Mailed:	December 30, 2005	Attorney:	Kelly K. Burris/lids



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7377H-000005/US

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY	DOCKET NO.	CONFIRMATION NO.
10/719,327	11/21/2003	Kenneth F. Fennewald		7377-0 0005/US	2615

28997 7590 02/24/2006

HARNESS, DICKEY, & PIERCE, P.L.C
7700 BONHOMME, STE 400
ST. LOUIS, MO 63105

EXAMINER

FASTOVSKY, LEONID M

ART UNIT PAPER NUMBER

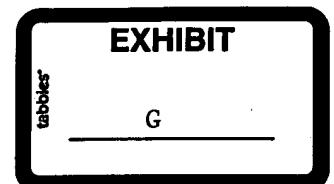
3742

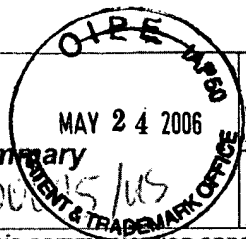
DATE MAILED: 02/24/2006

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FEB 23 2006

HARNESS, DICKEY & PIERCE
ST. LOUIS, MISSOURI

Please find below and/or attached an Office communication concerning this application or proceeding.





Office Action Summary

1377H-000015/US

Application No.

10/719,327

Applicant(s)

FENNEWALD ET AL.

Examiner

Leonid M. Fastovsky

Art Unit

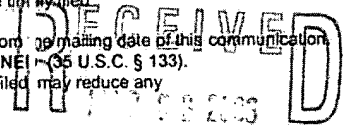
3742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED under 35 U.S.C. § 133. Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).



Status

- ☒ Responsive to communication(s) filed on 30 December 2005.
- ☒ This action is **FINAL**. ☐ This action is non-final.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 6-13 and 15-25 is/are pending in the application.
 - Of the above claim(s) 12, 15-18 and 24 is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 6-11, 13, 19-23 and 25 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- ☐ The specification is objected to by the Examiner.
- ☒ The drawing(s) filed on 13 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - ☐ All
 - ☐ Some
 - ☐ None of:
 - ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 6-8, 11, 19-23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (2001/0014373) in view of Braeutigam et al (EP745919) and evidenced by Takahashi (JP04206602).

Lin discloses a heater comprising a substrate 102, a DC power source 50 (col. 9, lines 31-40)), at least one dielectric layer 106 and at least one thick film resistive layer 106 having inherently adjustable temperature coefficient of resistance (TCR) because it is made from Ag/Pd, the same material of the heater as is evidenced by Takahashi (Abstract), thus the resistive layer is a heater element and a temperature sensor, but does not disclose how the temperature is adjusted and a two-wire controller.

Braeutigam discloses a method of regulation of a system including a heater element 8 also used as a temperature sensor, the resistance of which varies as a function of temperature of the heating element, by sensing the resistance, the temperature of the heater 12 can be determined and controlled by a two wire circuit 2 and a generator 3 (Abstract and Fig. 1-2).

It would have been obvious to one having ordinary skill in the art to modify Lin's invention to include a temperature controller as taught by Braeutigam, wherein the

Art Unit: 3742

controller determines temperature of the heater using the resistance of the resistance layer and controls the heater temperature accordingly.

As for claims 8, it would have been obvious to one having ordinary skill in the art to modify Lin's invention to use an AC control as an alternative source if the DC source is not available

As for claim 11, Lin discloses a microprocessor 90a and comparator 102 (col. 10, lines 10-50).

As for claim 19, Lin in view of Braeutigam can use the method of operating the heater as taught by Braeutigam because they disclose all structural elements of the invention and are capable of so perform.

As for claims 20-23, it would have been obvious to one having ordinary skill in the art to modify the invention of Lin in view of Braeutigam to include calibration steps as conventional steps in order to better control the heater temperature.

3. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin in view of Braeutigam and further in view of Lumsden.

Lin in view of Braeutigam discloses substantially the claimed invention, but does not disclose a controller having an angle firing and a shunt resistor. Lumsden teaches a controller 8 comprises an angle firing (col. 7, lines 1-10) and shunt resistor (col. 10, lines 6-17). It would have been obvious to one having ordinary skill in the art to modify the invention of Lin in view of Braeutigam to include a controller comprising an angle firing and a shunt resistor for efficiency-maximization of the controller current as taught by Lumsden (col. 7, lines 1-13).

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4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin in view of Braeutigam and further in view of Waggoner et al.

Lin in view of Braeutigam discloses substantially the claimed invention, but does not disclose a controller with firmware. Waggoner teaches a heater resistor having a controller 80 comprising firmware. It would have been obvious to one having ordinary skill in the art to modify the invention of Lin in view of Braeutigam to include a controller comprising firmware in order to control various functions as taught by Waggoner (col. 2, lines 63-67).

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

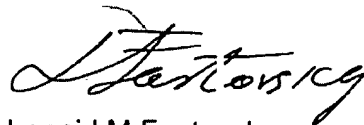
Response to Arguments

6. Applicant's arguments with respect to claims 6-11, 13, 19-23 and 25 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid M Fastovsky whose telephone number is 571-272-4778. The examiner can normally be reached on M-Th. 8.00 am - 6.00 pm.

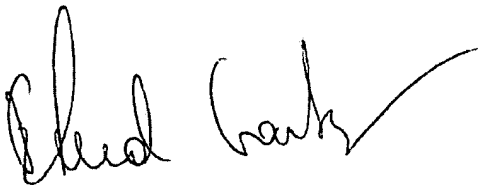
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Leonid M Fastovsky
Examiner
Art Unit 3742

Imf



EHUD GARTENBERG
SUPERVISORY PATENT EXAMINER

2/6/06

Notice of References Cited	Application/Control No. 10/719,327	Applicant(s)/Patent Under Examination FENNEWALD ET AL.	
	Examiner Leonid M. Fastovsky	Art Unit 742	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name		Classification
*	A	US-2001/0014373	08-2001	Lin et al.		427/454
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name		Classification
	N	JP04206602	11-1990	Japan	Takahashi		H017/00
	O	EP745919	12-1996	Germany	Braeutigam		G05D 23/24
	P						
	Q						
	R						
	S						
	T						

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)				
	U					
	V					
	W					
	X					

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

DERWENT-ACC-NO: 1997-013882

DERWENT-WEEK: 199702

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TITLE: Temp. regulation of electrical heating element
e.g. for SMD soldering equipment - using element
alternately for heating and as temp. sensor by detecting change
in resistance

INVENTOR: BRAEUTIGAM, W

PATENT-ASSIGNEE: KOCH V[KOCHI]

PRIORITY-DATA: 1995EP-0108214 (May 30, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
PAGES MAIN-IPC		
EP 745919 A1	December 4, 1996	()
004 G05D 023/24		

DESIGNATED-STATES: DE

CITED-DOCUMENTS: DE 2757334; GB 2123991 ; US 4086466 ; US 5120936

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO
APPL-DATE		
EP 745919A1	N/A	1995EP-0108214
May 30, 1995		

INT-CL (IPC): G05D023/24

ABSTRACTED-PUB-NO: EP 745919A

BASIC-ABSTRACT:

An AC voltage is applied to a rectifier [1] that generates an output to a voltage stabilising circuit [2]. A clock signal generator [3] controls the alternating cycle of heating and measurement of temp. In the

measurement phase
the heating is interrupted and the resistance of the heating element
[8] is
compared [5] with a reference stage [4] output This determines if the
measured
value is above or below the reference and controls a power switching
device [7]

ADVANTAGE - Uses heating element as temperature sensor.

CHOSEN-DRAWING: Dwg.1/2

TITLE-TERMS: TEMPERATURE REGULATE ELECTRIC HEAT ELEMENT SMD SOLDER
EQUIPMENT
ELEMENT ALTERNATE HEAT TEMPERATURE SENSE DETECT CHANGE
RESISTANCE

DERWENT-CLASS: T06 V04 X24

EPI-CODES: T06-B13B1; V04-R04A3L; V04-R04B; X24-A02

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N1997-012054



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 745 919 A1

(12)

EUROPÄISCHE PATENTANMELDUNG

(43) Veröffentlichungstag:
04.12.1995 Patentblatt 1996/49

(51) Int. Cl.⁶: G05D 23/24

(21) Anmeldenummer: 95108214.8

(22) Anmeldetag: 30.05.1995

(84) Benannte Vertragsstaaten:
DE

(72) Erfinder: Bräutigam, Wilfried
D-64756 Mossautal (DE)

(71) Anmelder: Koch, Volker
D-28329 Bremen (DE)

(54) Verfahren zur Temperaturregelung eines Heizelementes

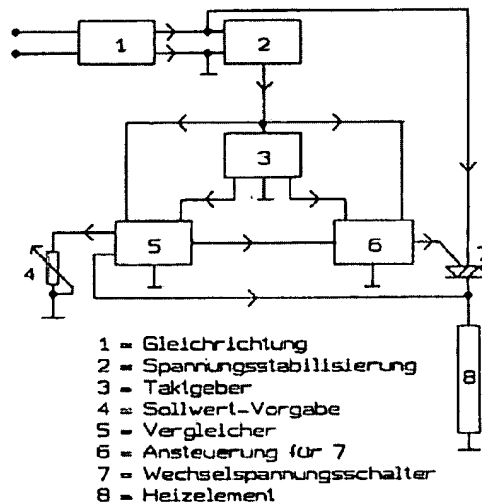
(57) Es gibt eine Vielzahl elektrisch und elektronisch geregelter Heizelemente, die mittels Temperatursensoren (Thermoelemente, NTC-PTC Sensoren etc.) je nach vorgewählter Temperatureinstellung auf konstanter Temperatur gehalten werden.

Bei dem hier anzumeldenden Patent wird ganz auf Sensor oder Meßwiderstand verzichtet. Das Heizelement wird selbst zum Fühler.

Die Wechselspannung wird mittels Gleichrichtung (1) zu einer pulsierenden Gleichspannung, die in der Spannungsstabilisierung (2) geglättet und stabilisiert wird.

Der Taktgeber (3) sorgt für eine zeitliche Aufteilung von Meßphase und Heizphase. In der Meßphase wird das Heizen unterbrochen und der Widerstand des Heizelementes (8) mit der Sollwert-Vorgabe (4) im Vergleich (5) verglichen. Je nachdem, ob der Widerstand des Heizelementes über oder unter dem des Sollwertes liegt, wird nun die Ansteuerung (6) für den Wechselspannungsschalter (7) mitgeteilt, ob geheizt oder nicht geheizt werden muß, um den Sollwert zu erreichen.

Abbildung 2



05201 Seite 3 von 5

EP 0 745 919 A1

Beschreibung

Es gibt eine Vielzahl elektrisch und elektronisch geregelter Heizelemente, die mittels Temperatursensoren (Thermoelemente, NTC-PTC Sensoren etc.) je nach vorgewählter Temperatureinstellung auf konstanter Temperatur gehalten werden. Diese Temperaturfühler beinhalten jedoch Nachteile wie z.B. Linearität, Temperaturempfindlichkeit, Ausgleichsleitung usw.

In der Patentschrift DE 3228202 wird bereits ein Verfahren aufgezeigt, welches bereits ohne Sensoren auskommt. Diese Anordnung hat jedoch den Nachteil, daß im Heizstromkreis zusätzlich ein Meßwiderstand erforderlich ist, um den durch das Heizelement fließenden Strom zu messen. Dieser Meßwiderstand ist außerdem eine Fehlerquelle, welche bei diesem Verfahren ausgeschaltet ist.

Bei dem hier angemeldeten Verfahren wird dieser Nachteil vermieden, sodaß diese Anordnung nicht mit dem oben genannten Patent identisch ist.

Bei dem hier anzumeldenden Patent wird ganz auf Sensor oder Meßwiderstand verzichtet. Das Heizelement wird selbst zum Fühler.

Die gesamte Schaltungsanordnung besteht nur aus:

- A. Heizelement
- B. Wechselspannungsschalter
- C. Regelkreis mit
 - a. Spannungsstabilisierung
 - b. Ablaufsteuerung
 - c. Vergleichler
 - d. Ansteuerung für den Wechselspannungsschalter

Beschreibung der Anordnung nach Abbildung 1:

Aus der Wechselspannung wird mittels Spannungsstabilisierung (1) die Gleichspannungsversorgung der Steuerschaltung sichergestellt. Der Widerstand des Heizelementes (6) sowie der Widerstand der Sollwert-Vorgabe (4) werden mit einem Gleichstrom beaufschlagt. Der Vergleichler (2) vergleicht den Spannungsabfall über dem Heizelement (6) mit dem Spannungsabfall über dem Widerstand der Sollwert-Vorgabe (4). Besitzt das Heizelement z.B. PTC-Verhalten (Keramik Heizelement), so muß geheizt werden, um einen höheren Widerstandswert zu erhalten. Wird dann z.B. der Widerstandswert an der Sollwert-Vorgabe (4) vergrößert, so meldet dies der Vergleichler (2) an die Ansteuerung (3) für den Wechselspannungsschalter (5), worauf dieser einschaltet und das Heizelement (6) an die Wechselspannung legt, worauf dieses heizt.

Die Wechselspannung am Heizelement (6) führt aber sofort zum Kippen des Vergleichlers (2), worauf dieser über die Ansteuerung (3) den Schalter (5) öffnet und den Heizvorgang unterbricht.

Wenn nun der Widerstandswert des Heizelementes (6) immer noch unterhalb der Sollwert-Vorgabe (4) liegt, schaltet der Vergleichler (2) über (3) und (5) die Wechselspannung sofort wieder ein.

Dieses schnelle Ein- und Ausschalten wiederholt sich so lange, bis der Widerstand des Heizelementes (6) die Sollwert-Vorgabe (4) erreicht hat, weil dann der Spannungsabfall am Heizelement (6) sowohl bei Wechselspannung als auch bei abgeschalteter Wechselspannung größer ist als der Spannungsabfall an der Sollwert-Vorgabe (4).

Wenn dann das Heizelement (6) wieder abkühlt und der Spannungsabfall des Gleichstromes mit sinkendem Widerstand zurückgeht wird der Heizvorgang bei Unterschreiten der Sollwert-Vorgabe erneut gestartet, bis der Sollwert wieder erreicht ist.

Durch diesen Regelvorgang wird eine konstante Temperatur am Heizelement erreicht, die um ca. $\pm 1\%$ schwankt.

Die Komponenten (1), (2) und (3), die auch aus Einzelbauelementen aufgebaut werden können, sind hier kosten- und platzsparend aus einer hochintegrierten Schaltung (IC) entnommen, die durch entsprechende Beschaltung die gewünschte Funktion ausführt. Dadurch ist die Realisierung auf einer nur wenige Quadrat-zentimeter großen Leiterplatte möglich, die auch in SMD-Technik ausgeführt werden kann, da die Regelung nur eine geringe Leistungsaufnahme besitzt.

Da die Temperaturschwankung der beschriebenen Anordnung für bestimmte Anwendungen zu groß ist (z.B. bei Lötgeräten für die SMD-Technik mit Leiterbahnbreiten von 0,2mm), kann mit höherem Aufwand, unter Beibehaltung des Meßverfahrens, eine bessere Temperaturstabilität erreicht werden.

Durch Erweiterung der Regelung zu Analog/Digital-Schaltung mit einem Taktgeber zur Ablaufsteuerung wird dies ermöglicht.

Eine diesbezüglich erweiterte Anordnung wird in Abbildung 2 gezeigt:

Die Wechselspannung wird mittels Gleichrichtung (1) zu einer pulsierenden Gleichspannung, die in der Spannungsstabilisierung (2) geglättet und stabilisiert wird. Der Taktgeber (3) sorgt für eine zeitliche Aufteilung von Meßphase und Heizphase. In der Meßphase wird das Heizen unterbrochen und der Widerstand des Heizelementes (6) mit der Sollwert-Vorgabe (4) im Vergleichler (5) verglichen. Je nachdem, ob der Widerstand des Heizelementes über oder unter dem Sollwertes liegt, wird nun die Ansteuerung (6) für den Wechselspannungsschalter (7) mitgeteilt, ob geheizt oder nicht geheizt werden muß, um den Sollwert zu erreichen. Das Heizen wird dann während der Heizphase durchgeführt bis die nächste Meßphase wieder stattfindet. Die Taktfrequenz wird dabei entsprechend hoch gewählt, um eine möglichst hohe Temperaturstabilität zu erreichen.

Dieses Verfahren kann auch mittels Computer ausgeführt werden.

Patentansprüche

1. Dadurch gekennzeichnet, daß das Heizelement als Temperatursensor dient, ohne zusätzlich einen Temperaturfühler, einen Meßwiderstand oder dergleichen zu benötigen. Das Heizelement dient unmittelbar zum Messen und Regeln der eigenen Temperatur. 5 10
2. Dadurch gekennzeichnet, daß die Dimensionierung des Heizelementes beliebig sein kann. 15
3. Dadurch gekennzeichnet, daß die Temperatur des Heizelementes ohne die Verwendung eines Temperatursensors erfaßt werden kann. 20
4. Dadurch gekennzeichnet, daß kein separater Meßwiderstand im Heizstromkreis eines Heizelementes zur Erfassung des Heizstromes erforderlich ist. 25
5. Dadurch gekennzeichnet, daß der Widerstand des Heizelementes mit einem Widerstands-Sollwert verglichen wird. 30
6. Dadurch gekennzeichnet, daß der Widerstand des Heizelementes und somit die Temperatur des Heizelementes mittels Regelung auf konstantem Wert gehalten werden kann. 35
7. Dadurch gekennzeichnet, daß ein Taktgeber feste Zeiten für eine Meßphase und eine Heizphase vorgibt. Während der Meßphase findet kein Heizen statt. Während der Meßphase fließt ein geringer Meßstrom durch das Heizelement. Während der Meßphase wird der ohmsche Widerstand des Heizelementes gemessen. Es findet eine periodische Abfrage des Widerstandes am Heizelement statt. 40
8. Dadurch gekennzeichnet, daß der Regelverlauf ein linearer ist. 45
9. Dadurch gekennzeichnet, daß die Regelung auch mittels Computer erfolgen kann. 50

50

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Abbildung 1

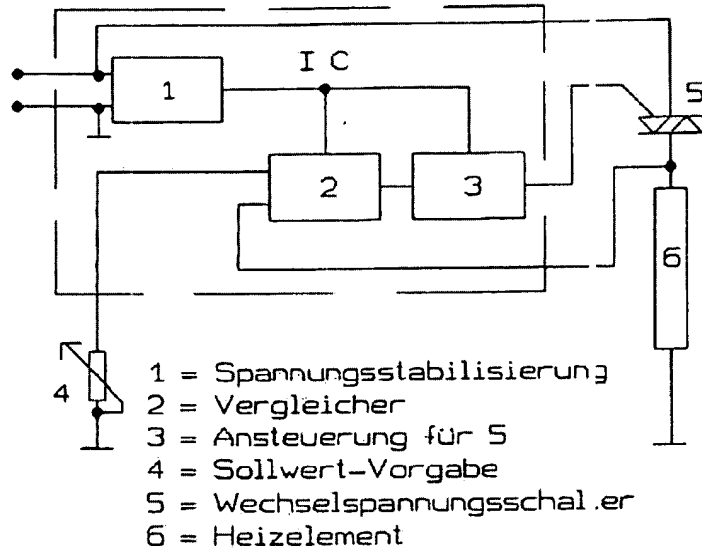
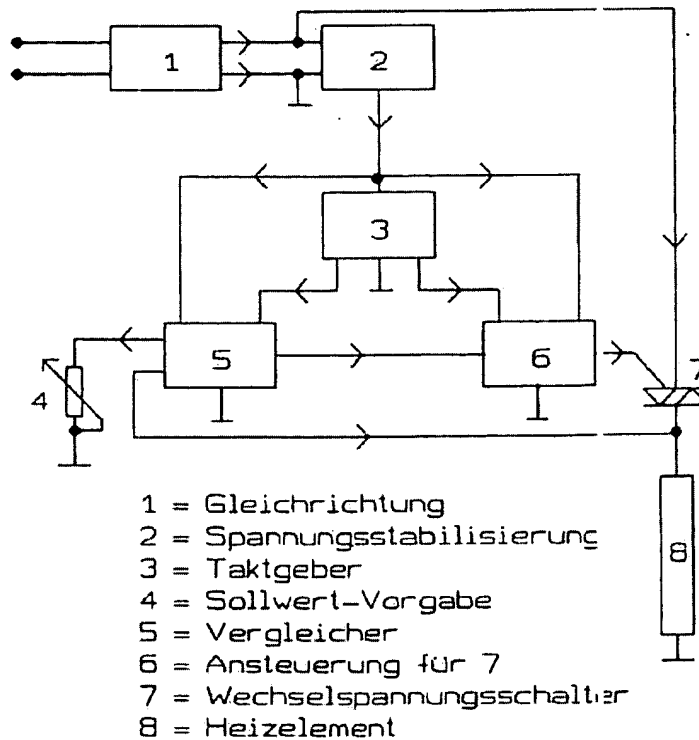


Abbildung 2





Europäisches
Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 95 10 8214

EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der ausführenden Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.6)
X	US-A-5 120 936 (J. SHYU ET AL.) * Spalte 3, Zeile 1 - Spalte 5, Zeile 49; Abbildungen 1,2 *	1-9	G05D23/24
X	DE-A-27 57 334 (BEURER GMBH & CO.) * Seite 6, Zeile 11 - Zeile 16 * * Seite 8, Zeile 20 - Seite 10, Zeile 17 * * Seite 12, Zeile 7 - Seite 14, Zeile 8 * * Seite 16, Zeile 5 - Zeile 14; Abbildungen 1-3 *	1-7,9	
X	GB-A-2 123 991 (HIDEO SUGIMORI) * Seite 1, Zeile 55 - Seite 2, Zeile 16; Abbildung 2 *	1-7	
X	US-A-4 086 466 (R. SCHARLACK) * Zusammenfassung * * Spalte 6, Zeile 25 - Zeile 44; Abbildung 7 *	1-6	
			RECHERCHIERTE SACHGEBIETE (Int.Cl.6)
			G05D
Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt			
Recherchierort DEN HAAG		Abschlußdatum der Recherche 7. Juli 1995	Prüfer Helot, H
KATEGORIE DER GENANNTEN DOKUMENTE		T : der Erfindung zugrunde liegende Theorien oder Grundsätze E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist D : in der Anmeldung angeführtes Dokument L : aus anderen Gründen angeführtes Dokument A : Mitglied der gleichen Patentfamilie, Überwindung oder Dokument	
X : von besonderer Bedeutung allein betrachtet Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie A : technologischer Hintergrund O : schriftliche Offenbarung P : Zwischenliteratur			

EPO FORM 150 (01/91) (PUBLI)

PAT-NO: JP404206602A

**DOCUMENT-
IDENTIFIER:** JP 04206602 A

TITLE: THICK-FILM RESISTANCE
COMPOSITION

PUBN-DATE: July 28, 1992

INVENTOR-INFORMATION:

NAME	COUNTRY
TAKAHASHI, YOSHIISA	

ASSIGNEE-INFORMATION:

NAME	COUNTRY
TANAKA KIKINZOKU INTERNATL KK	N/A

APPL-NO: JP02333545

APPL-DATE: November 30, 1990

INT-CL (iPC): H01C007/00

ABSTRACT:

PURPOSE: To obtain a thick-film resistance composition substance whose sheet resistance value is low and whose TCR

is stable by using the following: a noble-metal powder composed of silver and palladium in a prescribed mixture ratio; and an inorganic bonding agent containing a glass frit having a specific softening point.

CONSTITUTION: The following are mixed with a vehicle in which ethyl cellulose has been dissolved to terpinol: a noble-metal powder which is composed of 44 to 47wt.% of silver and 53 to 56wt.% of palladium; and an inorganic bonding agent powder containing a glass frit whose softening point is at 750 to 900°C and which is composed of 40 to 60wt.% of SiO₂, 10 to 20wt.% of Al₂O₃, 3 to 12wt.% of B₂O₃, 0.5 to 5wt.% of MgO and 15 to 30wt.% of Cab. At this time, titania or alumina at 1 to 25 pts.wt. is contained in the inorganic bonding agent as required. The inorganic bonding agent contains the glass frit at 10 to 120 pts.wt. against the noble-metal powder at 100 pts.wt. Then, the mixture is printed on an alumina ceramic substrate; it is baked in a conveyor furnace; an electric current is formed. A resistive paste whose resistance value is low and whose TCR is stable is obtained. Thereby, a small-sized and high-density interconnection can be realized.

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⑤ 日本国特許庁(JP)

⑥ 特許出願公開

⑦ 公開特許公報(A)

平4-206602

⑧ Int. Cl.

識別記号

庁内整理番号

⑨ 公開 平成4年(1992)7月28日

H 01 G 7/00

L

9058-5E

審査請求 未請求 請求項の数 4 (全4頁)

⑩ 発明の名称 厚膜抵抗組成物

⑪ 特 願 平2-333545

⑫ 出 願 平2(1990)11月30日

⑬ 発 明 者 高 橋 義 功 神奈川県厚木市飯山字台ノ岡245番21 田中マウセイ株式会社厚木工場内

⑭ 出 願 人 田中マウセイ株式会社 東京都中央区日本橋茅場町2丁目6番6号

明 細 書

1. 発明の名称

厚膜抵抗組成物

2. 特許請求の範囲

1. 貴金属粉末と無機結合剤とが有機ビヒクルに分散されてなる厚膜抵抗組成物において、

(A) 貴金属粉末が、銀44～47重量%とパラジウム58～59重量%の組成を有し、

(B) 無機結合剤が、酸化亜鉛750～900%のガラスフリットと必要に応じてチタニアもしくはアルミナを含有することを特徴とする厚膜抵抗組成物。

2. 無機結合剤が、貴金属粉末100重量部に対し、10～120重量部のガラスフリットであることと特徴とする請求項1に記載の厚膜抵抗組成物。

3. ガラスフリットが、貴金属粉末510、40～60%、Al₂O₃ 10～20%、B₂O₃ 3～12%、SiO₂ 5～5%、及びCaO 5～30%の組成を有することを特徴とする請求

項1～2に記載の厚膜抵抗組成物。

4. 無機結合剤が、ガラスフリットに加えて、チタニア又はアルミナを1～25重量%含有していることを特徴とする請求項1～3に記載の厚膜抵抗組成物。

3. 発明の詳細な説明

〔産業上の利用分野〕

本発明は絶縁基板上に印刷し焼成して導電基板上に印刷抵抗体を形成するための厚膜抵抗組成物に関する。

〔従来の技術〕

従来の厚膜回路において印刷抵抗体形成に導電粒子として酸化ルテニウム、あるいはバイロクロア型のルテニウム酸化物、ルテニウム酸ビスラースを用いたルテニウム系抵抗ペーストが一般に広く使用されている。ルテニウム系の抵抗ペーストは、上記の導電成分とガラスフリットを有機ビヒクルに分散させてなり、導電成分とガラスの配合比を変え、抵抗値を調整することにより所望の抵抗値を得ることができる。又、抵抗の温度係数(抵抗温度係数)を調整

を調整する目的で、 Cu 、 O 、 MnO 、 Al 、 O 、 TiO 、 ZrO 等の金属酸化物を加えることが一般に行われている。

〔発明が解決しようとする課題〕

しかしながら、ルテニウム系ペーストを用いて抵抗形成する場合、低い抵抗値の阻値が $3 \sim 5 \Omega/\square$ $10 \mu\text{m}$ までである。それ故、抵抗値として低いものが要求される電気回路の配線においては膜厚を厚くしたり、スクエア数を少なくしている。そのため抵抗体を広い面積で印刷しなければならず厚膜配線板の水型化・高価性が問題である。

一方、ルテニウム系抵抗ペーストの代わりに Ag と Pd 系ペーストを用いることも考えられるが、 TiCN が大きいことで、抵抗体として置かれる精度が得られにくい。

本発明は上記の課題を解決し、シート抵抗値が $0.1 \sim 300 \Omega/\square$ $10 \mu\text{m}$ の範囲であり、かつ TiCN が $\pm 50 \text{ ppm}$ を有する印刷抵抗体を形成するための厚膜抵抗組成物を提供することを目的とする。

μm で表面積が $1 \sim 10 \text{ cm}^2/\square$ のものがある。

貴金属粉末とともに本発明に係る抵抗組成物を形成する助溶剤粉末は少なくともガラスフリットを含んでおり、必要に応じてチタニウムまたはアルミウムを含んでもよい。

助溶剤粉末の配合量は、所望の抵抗値を得るように調整すればよいが本発明の用途では、貴金属粉末 100 重量部に対し $10 \sim 120$ 重量部の範囲が好ましい。

本発明で用いられるガラスフリットは $750 \sim 900^\circ\text{C}$ に軟化点がある珪酸塩ガラスでその組成が重量比で SiO_2 $40 \sim 60$ 、 Al_2O_3 $10 \sim 20$ 、 B_2O_3 $5 \sim 12$ 、 CaO $5 \sim 5$ 、 CaF_2 $1 \sim 3$ であり更に好ましくは重量比で SiO_2 $50 \sim 60$ 、 Al_2O_3 $12 \sim 18$ 、 B_2O_3 $5 \sim 10$ 、 CaO $2 \sim 5$ 、 CaF_2 $1 \sim 3$ のものや $60 \sim 850^\circ\text{C}$ の軟化点を有するものである。

金属酸化物としてはチタニウムまたはアルミナ

〔課題を解決するための手段〕

本発明は貴金属粉末と助溶剤粉末とが有機ビタールに分散されてなる厚膜抵抗組成物において、

(A) 貴金属粉末が、銀 $44 \sim 47$ 重量%とパラジウム $53 \sim 56$ 重量%の組成を有し、

(B) 助溶剤粉末が、軟化点 $750 \sim 900^\circ\text{C}$ でのガラスフリットと必要に応じてチタニウムもしくはアルミウムを含ませることを特徴とする厚膜抵抗組成物である。

本発明における厚膜抵抗組成物及びパラジウムからなる貴金属粉末を含有している。これらの金属組成比は重量比で銀パラジウムが $47/53 \sim 44/56$ である。又、銀とパラジウムは、貴金属とパラジウム粉末の混合粉を用いてもよく、銀とパラジウムの合金粉末でもよい。使用される貴金属は平均粒径が $0.5 \sim 7 \mu\text{m}$ で表面積が $0.5 \sim 3 \text{ cm}^2/\square$ のものが、パラジウム粉末は平均粒径が $0.1 \sim 1.5 \mu\text{m}$ でその表面積が $0.5 \sim 20 \text{ cm}^2/\square$ のものがそれぞれ好ましい。

又、合金粉末の場合は、平均粒径が $0.1 \sim 5$

のどちらでもよいが粒径が $0.1 \mu\text{m}$ 以下の微細粉が好ましい。しかしながら多少粒径が大きいものを用いても、さらさらしたペースト、フリット等の有機化剤を用いても所望の特性は十分期待される。

また、金属酸化物の含有量は、 $1 \sim 25$ 重量部が好ましい。

貴金属及び助溶剤粉末を分散させる有機ビタールは、エチルセルロース、アクリル樹脂等の樹脂をタービネオール、ナチル、ビニール、ポリシオイル等の有機溶剤に溶解したものが好ましく用いられ、配合量は、 $20 \sim 120$ 重量部程度が望ましい。

〔作用〕

このような組成から成る本発明の厚膜抵抗組成物をアルミナセラミックス基板上に印刷し、乾燥の後に $800 \sim 900^\circ\text{C}$ で約 $5 \sim 30$ 分焼成して厚膜抵抗物が形成された回路基板が作成される。

このように作成された本発明の厚膜抵抗組成物が

得られた固形物では、乾燥量レシオ0.1~3.0のゾロ／10以内でかつTCRが±5.0ppm以内におさまっている。

一般にAとPの割合のすCCR特性においてAとPの比が40/60前後で極めてTCRが低くなる領域がある。本発明ではこの性質を利用して、AおよびPからなる貴金属粉末を導電粒子とし、低誘電率に特定化されたガラス及び低誘電率化物を配合せしめ、組成割合とすることにより、乾燥量レシオ0.1~3.0でTCRが±5.0ppmを有する低誘電ペーストを提供せんとするものである。

ここで、特定化ガラスフリットを用いた組成としては850℃前後で焼成される際、低誘電率の焼成をできるだけ小さく抑えるためであり、0.1~3.0の範囲でTCRを安定して小さく抑えるためである。この低誘電率化物を必要に応じて用いる理由として、焼成時の低誘電率の急激な上昇による割れ等の発生を防止するためである。

(実施例)

以下実施例に基づいて本発明をより詳細に説明

するが、該実施例は本発明を限定するものではない。

エチルセルロースをタービオールに溶解したビニル中に微細に分散され、貴金属粉末と低誘電率化粉末を有する炭に示すような配合比で混合し、乾燥分岐した厚膜抵抗組成物4.96gアルミセラミックス基板上に印刷し、シンパア炉中ピーグ温度850℃における10分間の焼成を1回行い、厚膜7~14μmの電気回路を形成した。ガラスフリットとして第1炭B、C、Eの組成を有するSiO₂-Al₂O₃-O₂-B₂O₃-CaO-CdO系ガラスを用いた組成物(3,5,6例)と低誘電率を有するガラスフリットAを用いた組成物及びAとPの比を44/56~17/83以外の範囲で作成した組成物(比較例)を使用した。

(以下表)

	組成(重量%)						焼成点 (℃)
	PbO	SiO ₂	Al ₂ O ₃	B ₂ O ₃	ZnO	MgO	CaO
A	6.9	37.5	0.5	10	1.7	—	—
B	—	50	12	10	—	5	29
C	—	55	16	9	—	3	1.7
D	—	58	15	6	—	2	1.6

表1

	ガラスフリット						組成(重量%)		ビニル
	A	B	C	D	E	F	貴金属粉末	低誘電率化粉末	
例1	4.5	5.5	—	12.3	—	—	—	—	25
例2	4.5	5.5	29.6	—	—	—	—	—	54
例3	4.5	5.5	—	48.9	—	6.9	—	—	67
例4	4.5	5.5	—	—	—	—	—	—	119
例5	4.5	5.5	—	12.3	—	—	—	—	25
例6	4.7	9.3	—	—	—	—	—	—	25
例7	4.4	5.6	—	12.3	—	—	—	—	25
例8	4.5	5.5	12.3	—	—	—	—	—	25
例9	4.5	5.5	24.5	—	—	4.9	—	—	46
例10	4.8	5.2	—	12.3	—	—	—	—	29
例11	4.9	5.1	—	12.3	—	—	—	—	25
例12	4.3	5.7	—	12.3	—	—	—	—	25

第3表

		特 性		
		シート抵抗 (Ω/\square)	H ₀₁ TCR (ppm/°C)	C ₀₁ TCR (ppm/°C)
実 施 例	1	0.085	-11	8
	2	0.597	-8	32
	3	2.83	-2	35
	4	29.7	-9	36
	5	0.098	-11	41
	6	0.099	14	48
	7	0.116	-20	48
比 較 例	1	0.088	139	177
	2	0.289	72	151
	3	0.092	223	302
	4	0.099	167	201
	5	0.095	-66	-3

い抵抗値が要求される場合においても従来の
ルテニウム系で行っていたような面厚を厚くし、
スクエア数を少なくすることなく小型かつ高密度
な配線が可能とする。

第3表から明らかな通り、本実施例によるAg
/Pd比(質量%)44/56〜47/53の範
囲において750〜900℃の高酸化点を有する
SiO₂、Al₂O₃、TiO₂、ZrO₂、MgO-Ca
O系ガラスフリットを用いた抵抗体組成物はTCR
が±50ppm以内である。

一方、Ag/Pd比が44/56〜47/53
の範囲以外の組成の抵抗体組成物はTCRが±5
0ppmの範囲を越えている。さらにAg/Pd
比は48/52とし、ガラスフリットとして従来
まで厚膜ペーストに広く使用されてきた低酸化点
ガラスを用いた抵抗体組成物では、同じくTCR
が±50ppmを越えてしまう。

【発明の効果】

本発明ではAg/Pd比を重要因子として用い、
高酸化点を有するガラスフリットとを混合して成る
抵抗体組成物が組成により抵抗値が0.1〜30
 Ω/\square 、及びTCRが±50ppm以
内の特性を有する。

これにより、厚膜配線において抵抗体として適

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